ABB solar inverters

Hardware manual
PVS800-57 central inverters (100 to 630 kW)

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List of related manuals

Inverter hardware manual	Code (English)	
PVS800-57 hardware manual	*3AUA0000053689*	1)
Inverter firmware manual		
PVS800 central inverters firmware manual	*3AUA0000058422*	1)
and adaptive program application guide	*3AUA0000091276*	
Option manuals and quides		
PVS-JB-8-M junction box with monitoring for PVS800 central inverters user's manual	*3AUA0000087106*	2)

1) Delivered as a printed copy with the inverter.

2) Delivered as a printed copy with the option.

Hardware manual

PVS800-57 central inverters
(100 to 630 kW)

Table of contents

1. Safety instructions

4. Mechanical installation

6. Electrical installation

8. Start-up

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Table of contents

List of related manuals 2

1. Safety instructions

What this chapter contains 11
Use of warnings 11
Safety in installation and maintenance 12
General seven step safety precautions 12
Electrical safety 13
Grounding 14
General safety 15
Printed circuit boards 17
Fiber optic cables 17
Start-up and operation 18

2. Introduction to the manual

What this chapter contains 19
Target audience 19
Contents of the manual 19
Related documents 20
Categorization by frame size and option code 20
Quick installation, commissioning and operation flowchart 20
Terms and abbreviations 21

3. Operation principle and hardware description

What this chapter contains 23
Product overview 24
Block diagram of solar generator system 25
Main circuit diagram of the inverter system 26
Electrical power network supervision function 31
Positive or negative pole grounding (options +F282 and +F283) 31
Cabinet layout of frame R7i 32
Cabinet layout of frame R8i 33
Cabinet layout of frame 2 × R8i 34
Door devices 35
Inverter module (R7i) 35
Inverter module (R8i) 35
Connections and interfaces overview 37
CDP-312R Control Panel 38
Circuit boards 39
Type designation labels 39
Inverter label 39
Inverter module label 39
Type designation key 40

4. Mechanical installation

What this chapter contains 43

Checking the installation site 43
Required tools 44
Checking the delivery 44
Moving the unit 45
Placing the unit 46
Overview of the installation process 46
Fastening the cabinet to the floor 47
Alternative 1 – Clamping 47
Alternative 2 – Using the holes inside the cabinet 48
Miscellaneous 49
Preventing the recirculation of hot air 49
Ventilation duct at the air outlet of the cabinet 49
Calculating the required static pressure difference 50
Cable duct in the floor below the cabinet 51

5. Planning the electrical installation

What this chapter contains 53
Selecting the transformer 53
Requirements for the transformer 54
Selecting the grid disconnecting device 55
Selecting the DC input disconnecting device 55
Checking the compatibility of the solar generator and inverter 55
Selecting the power cables 55
General rules 55
Recommended AC output power cable types 57
Not allowed power cable types 57
Selecting the control cables 57
General rules 57
Signals in separate cables 57
Signals allowed to be run in the same cable 58
Relay cable type 58
Routing the cables 58
Separate control cable ducts 59
Implementing short-circuit and thermal overload protection 59
Protecting the inverter and AC output cable in short-circuit situations 59
Protecting the photovoltaic generator and DC input cable in short-circuit situations 59
Protecting the inverter and the AC output cable against thermal overload 59
Supplying power for the auxiliary circuits 60
Supplying circuits from the AC output of the inverter 60
Implementing ground fault monitoring in IT (ungrounded) systems 60
Insulation monitoring device (option +Q954) 60
Operation principle of the measuring circuit 61
Safety information 61
Customer wiring 61
Start-up 61
More information 62
Implementing positive or negative pole grounding (options +F282 and +F283) 62
Limiting the conducted disturbances with the EMC filter
(option +E216) in low-voltage TN (grounded) networks 62
Instructions for inverters delivered without input DC fuses (option +0F291) 62
Mechanical installation of the input DC fuses 63

6. Electrical installation

What this chapter contains . . . 65
Warnings . . . 65
Checking the insulation of the assembly . . . 65
Inverter . . . 65
AC output cable . . . 65
DC input cable(s) . . . 65
Photovoltaic generator . . . 66
Checking the compatibility with IT (ungrounded) systems . . . 66
Connecting the power cables . . . 66
Connection diagram . . . 66
DC input cable connection procedure . . . 67
AC output cable connection procedure . . . 68
Connecting the external power supply cable for the auxiliary circuit . . . 69
Connecting the junction box power supply (option +G410) . . . 69
Connecting the EMC filter (option +E216) . . . 69
Connecting the control cables . . . 69
Default I/O connection diagram (RDCU – A43) . . . 70
Default I/O connection diagram (RDCU – A41) . . . 71
Default I/O connections (RDIO on RDCU – A41) . . . 72
Connection procedure . . . 72
Making 360 degrees grounding at the cabinet lead-through for the control cables 72
Connecting the cables to the I/O terminals . . . 74
Connecting a PC . . . 74
Installing optional modules . . . 74
Mechanical installation . . . 74
Wiring the modules . . . 74

7. Installation checklist

What this chapter contains . . . 75
Checklist . . . 75

8. Start-up

What this chapter contains . . . 77
Start-up procedure . . . 77
SAFETY . . . 77
PRIMARY CHECKS . . . 77
FIRST START (local control mode) . . . 78
SETTING THE INVERTER MASTER CONTROL PROGRAM PARAMETERS . . . 80
SETTING UP FIELDBUS CONTROL (remote control mode) . . . 80
SETTING UP THE INSULATION MONITORING DEVICE (option +Q954) . . . 80
SETTING UP THE CABINET HEATER (option +G300) . . . 80
Connecting DriveWindow . . . 81
Configuring the NETA-01 Ethernet Adapter Module . . . 82

9. Fault tracing

What this chapter contains . . . 83
LEDs . . . 83
Warning and fault messages displayed by the CDP-312R Control Panel . . . 84
Fault: Same ID numbers . . . 84
Fault tracing of the insulation monitoring device (option +Q954) . . . 84

10. Maintenance

What this chapter contains . . . 85
Maintenance intervals . . . 85
Cleaning the interior of the cabinet . . . 86
Replacing the air filters . . . 86
Inlet (door) filters . . . 86
Cleaning the heatsink . . . 87
Checking and cleaning the power connections (R8i, 2 × R8i) . . . 87
Fans . . . 88
Replacing the LCL filter cooling fan (R7i) . . . 88
Replacing the LCL filter cooling fan (R8i, 2 × R8i) . . . 89
Replacing the incoming cubicle door fans (frames R8i and 2 × R8i and the output cubicle door fan (frame R8i) . . . 90
Replacing the output cubicle swing-out frame fans (frame 2 × R8i) . . . 91
Replacing the cabinet roof fans (frames R8i and 2 × R8i with option +H377) . . . 92
Replacing the cooling fan of the inverter module (R7i) . . . 93
Replacing the cooling fan of the inverter module (R8i, 2 × R8i) . . . 94
Replacing the inverter module (frames R8i, 2 × R8i) . . . 95
Extracting the module from the cubicle . . . 95
Inserting the module into the cubicle . . . 97
Replacing the LCL filter . . . 97
Capacitors . . . 97
Reforming the capacitors . . . 98

11. Technical data

What this chapter contains . . . 99
Ratings . . . 99
Derating . . . 100
Temperature derating of types -0100kW-A, -0250kW-A and -0500kW-A . . . 100
Temperature derating of types -0315kW-B and -0630kW-B . . . 100
Altitude derating . . . 100
Combined derating . . . 100
Type equivalence table . . . 101
Fuses . . . 101
Main circuit AC fuses . . . 101
Inverter DC fuses . . . 101
DC fuses for standard DC input connections . . . 102
DC fuses for 4 DC input connections (option +4H382) . . . 102
DC fuses for 8 DC input connections (option +8H382) . . . 102
DC fuses for 12 DC input connections (option +12H382) . . . 102
Miniature DC circuit breakers (option +H377) . . . 102
Miniature circuit breakers for options +G300 and +G410 . . . 102
Dimensions, weights and free space requirements . . . 103
Losses, cooling data and noise . . . 103

Terminal and lead-through data for the DC input power cable . . . 104
Terminal and lead-through data for the AC output power cable . . . 105
AC output connection specification . . . 106
DC input connection data . . . 107
Auxiliary power connection data . . . 107
Control unit (RDCU/RMIO) connection data . . . 108
Analog inputs . . . 108
Constant voltage output . . . 108
Auxiliary power output . . . 108
Analog outputs . . . 108
Digital inputs . . . 108
Relay outputs . . . 109
DDCS fiber optic link . . . 109
24 V DC power input . . . 109
Efficiency . . . 111
Degrees of protection . . . 112
Ambient conditions . . . 113
Materials . . . 114
Auxiliary circuit power consumption . . . 114
CE marking . . . 115
Compliance with the European Low Voltage Directive . . . 115
Compliance with the European EMC directive . . . 115
Compliance with EMC standards EN 61000-6-2:2005 and EN 61000-6-4:2007 . . . 115
Applicable standards and requirements . . . 115
Medium voltage network . . . 116
Low-voltage network . . . 116
“C-tick” marking . . . 116
VDE marking . . . 117
Golden Sun marking . . . 117

12. Dimension drawings

What this chapter contains . . . 119
Frame R7i . . . 120
Frame R8i . . . 123
Frame 2 × R8i . . . 130

Further information

1

Safety instructions

What this chapter contains

This chapter contains the safety instructions which you must follow when installing, operating and servicing the inverters. If ignored, physical injury or death may follow, or damage may occur to the inverter, photovoltaic generator or adjoining equipment. Read the safety instructions before you work on the unit.

Use of warnings

Warnings caution you about conditions which can result in serious injury or death and/or damage to the equipment. They also tell you how to avoid the danger. Notes draw attention to a particular condition or fact, or give information on a subject. The warning symbols are used as follows:

Electricity warning warns of hazards from electricity which can cause physical injury and/or damage to the equipment.

General warning warns about conditions, other than those caused by electricity, which can result in physical injury and/or damage to the equipment.

Electrostatic sensitive devices warning warns of electrostatic discharge which can damage the equipment.

Safety in installation and maintenance

General seven step safety precautions

These precautions are intended for all who work on the inverter, its input and output cables, the transformer or photovoltaic generator.

WARNING! Before any work, repeat the seven steps safety precautions described below.

☐ **1. Clearly identify the work location.**

Read the safety instructions of the work area and the component you are working on.

See the subsections below and component-specific manuals.

☐ **2. Disconnect and secure against reconnection.**

Disconnect all possible power supplies. Lock the disconnectors to open position and attach a warning notice to them. After disconnection of the inverters, always wait for 5 minutes to let the intermediate circuit capacitors to discharge.

☐ **3. Protect against any other live parts.**

☐ **4. Take special precautions when close to bare conductors.**

☐ **5. Check that the installation is dead.**

Always ensure by measuring that there is no power connected.

☐ **6. Apply temporary grounding for work.**

Connect the AC and DC busbars to the PE using an appropriate temporary grounding tool.

View of AC busbars grounding

☐ **7. Issue a permit to work.**

Electrical safety

These warnings are intended for all who work on the inverter, its input and output cables, the transformer or photovoltaic generator.

WARNING! Ignoring the following instructions can cause physical injury or death, or damage to the equipment

- **Only qualified electricians are allowed to install and maintain the inverter.**
- Never work on the photovoltaic generator or the inverter or its input or output cables when the inverter is connected to electrical power system or to the photovoltaic generator. After disconnecting the inverter from the electrical power system and the DC input, always wait for 5 min to let the intermediate circuit capacitors discharge before you start working on the inverter, its input and output cables or the photovoltaic generator.

  Always ensure by measuring with a multimeter (impedance at least 1 Mohm) that:
  1) Voltage between inverter phases (L1, L2, L3) and the frame is close to 0 V.
  2) Voltage between the inverter module terminals (UDC+ and UDC-) and inverter DC input terminals (L+ and L-) and the frame is close to 0 V.
- Before working inside the inverter cabinet, isolate the AC line cables and busbars from the electrical power system with the disconnector of the power system transformer. Also, isolate the inverter from the photovoltaic generator with the safety switch of the generator or by other means. The grid disconnecting device (disconnecting means) of the inverter does not isolate the AC output cables and terminals from the electrical power system. The DC main switch/switches or DC input circuit breakers do not isolate the DC input cables or terminals from the DC voltage supplied by the photovoltaic generator.
- Before working inside the inverter cabinet, switch off or isolate the auxiliary voltage supply from the inverter.
- Before working on the unit, apply temporary grounding for work. See page *12*.
- Do not work on the control cables when power is applied to the inverter or to the external control circuits. Externally supplied control circuits may cause dangerous voltages inside the inverter even when the main power on the inverter is switched off.
- Live parts inside the cubicle are protected against direct contact when all protective plastic covers and metallic shrouds are in place. Pay special attention when handling sharp metallic shrouds.
- Do not make any insulation or voltage withstand tests on the inverter or inverter modules.

Note:

- The DC connection terminals (UDC+, UDC-, L+ and L-) carry a dangerous DC voltage (up to 1000 V).
- Depending on the external and internal wiring, dangerous voltages (115 V or 230 V) may be present at different terminals in the auxiliary connection unit.
- With options +F282 and +F283, one of the poles of the photovoltaic generator is grounded, and therefore, the other pole has full voltage against ground (up to 1000 V).
- When the photovoltaic generator cells are exposed to light (even if it is dim), the generator supplies DC voltage to the inverter.

Grounding

These warnings are intended for all who are responsible for the grounding of the inverter.

WARNING! Ignoring the following instructions can cause physical injury or death, increased electromagnetic interference and equipment malfunction.

- Ground the inverter and adjoining equipment to ensure personnel safety in all circumstances, and to reduce electromagnetic emission and interference.
- Make sure that grounding conductors are adequately sized as required by safety regulations.
- In a multiple-inverter installation, connect each inverter separately to protective earth (PE).
- When shielded AC power cables are used, make a 360° high frequency grounding of cable entries at the cabinet lead-through in order to suppress electromagnetic disturbances. In addition, connect the cable shields to protective earth (PE) in order to meet safety regulations.
- EMC filters are not allowed at the AC output of the inverter.
- Do not install the inverter on a TN (grounded) system.
- Do not install the EMC filter option (+E216) for the network side of the low voltage transformer on an (ungrounded) system.

Note:

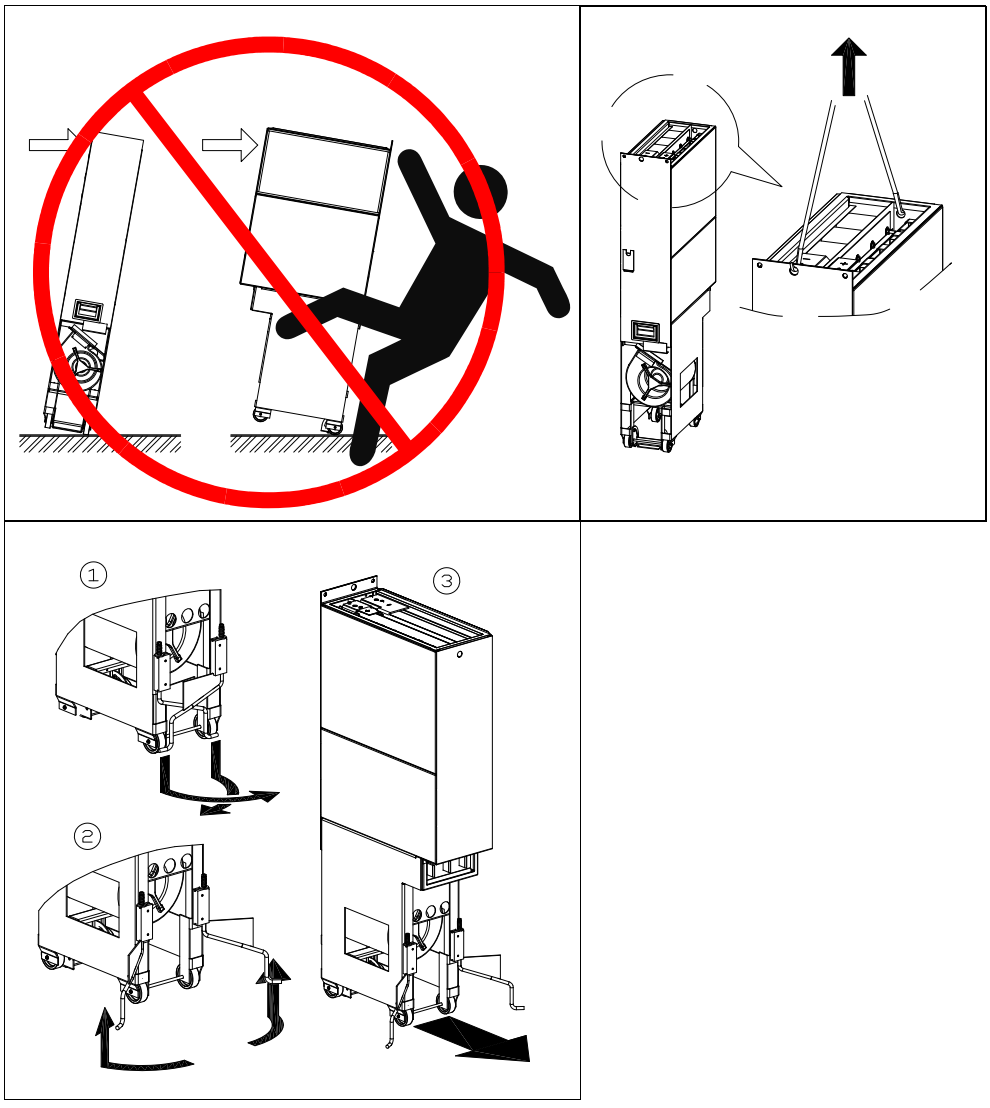
- Power cable shields are suitable for equipment grounding conductors only when adequately sized to meet safety regulations.
- As the touch current of the inverter is higher than 3.5 mA AC or 10 mA DC, a fixed protective earth connection is required by IEC/EN 62109, 5.2.5.

General safety

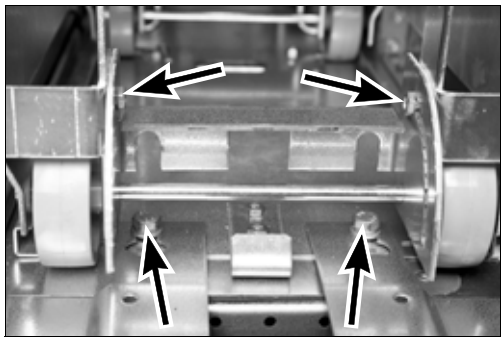
These instructions are intended for all who install and service the inverter.

WARNING! Ignoring the following instructions can cause physical injury or death, or damage to the equipment.

- Use extreme caution when manoeuvering an inverter or LCL filter module that runs on wheels. Extend the support legs of the module when it is removed from the cabinet! Do not tilt the module! The modules are heavy and have a high center of gravity. They topple over easily if handled carelessly.
- Lift the module by the upper part only using the lifting hole(s) at the top!



- When removing a module which is equipped with wheels, pull the module carefully out of the cubicle along the ramp. Make sure the wires do not catch. While pulling on the handle, keep a constant pressure with one foot on the base of the module to prevent the module from tipping over. Use safety shoes with metal toe cap to avoid foot injury.
- When replacing a module which is equipped with wheels, push the module up the ramp into the cubicle. Keep your fingers away from the edge of the module front plate to avoid pinching them between the module and the cubicle. Also keep a constant pressure with one foot on the base of the module to stabilize the movement.
- Do not use the ramp with plinth heights over 50 mm.The ramp supplied with the inverter is designed for a plinth height of 50 mm (the standard plinth height of ABB cabinets). Tighten the four fastening bolts of the ramp carefully.



- Beware of the cooling fan blades. The fans may continue to rotate for a while after the disconnection of the electrical supply.
- Beware of hot surfaces. Some parts inside the inverter cabinet, such as heatsinks of power semiconductors, remain hot for a while after the disconnection of the electrical supply.
- Make sure that borings and grindings do not enter the inverter when installing. Electrically conductive dust inside the unit may cause damage or lead to malfunction.
- Fastening the cabinet by riveting or welding is not recommended. However, if welding is necessary, ensure the return wire is properly connected close to the weld in order not to damage the electronic equipment in the cabinet. Also ensure that welding fumes are not inhaled.

Printed circuit boards

Ignoring the following instructions can cause equipment malfunction and damage to the equipment.

WARNING! The printed circuit boards contain components sensitive to electrostatic discharge. Wear a grounding wrist band when handling the boards. Do not touch the boards unnecessarily.

Fiber optic cables

Ignoring the following instructions can cause equipment malfunction and damage to the equipment.

WARNING! Handle the fiber optic cables with care. When unplugging optic cables, always grab the connector, not the cable itself. Do not touch the ends of the fibers with bare hands as the fiber is extremely sensitive to dirt. The minimum allowed bend radius is 35 mm (1.4 in.).

Start-up and operation

These warnings are intended for all who commission, plan the operation or operate the inverter.

WARNING! Ignoring the following instructions can cause physical injury or death, or damage to the equipment.

- Close the inverter AC main switch and miniature DC circuit breakers (option +H377) before start.
- Do not open the DC main switch when the inverter is running.
- Do not open the inverter AC main switch or and miniature DC circuit breakers option +H377) when the inverter is running.

WARNING! Ignoring the following instructions can cause physical injury or death, or damage to the equipment.

- Before adjusting the inverter and putting it into service, make sure that all equipment are suitable for operation.
- The maximum allowed number of power-ups by applying power, is five in ten minutes.

Note:

- If an external source for start command is selected and it is ON, the inverter will start immediately after fault reset.
- When the control location is not set to Local (L not shown in the status row of the display), the stop key on the control panel will not stop the inverter. To stop the inverter using the control panel, press the LOC/REM key and then the stop key .

2

Introduction to the manual

What this chapter contains

This chapter describes the intended audience and contents of the manual. It contains a flowchart of steps in checking the delivery, installing and commissioning the inverter. The flowchart refers to chapters/sections in this manual and other manuals.

Target audience

This manual is intended for people who plan the installation, install, commission, use and service the inverter. Read the manual before working on the inverter. You are expected to know the fundamentals of electricity, wiring, electrical components and electrical schematic symbols.

The manual is written for readers worldwide. Both SI and imperial units are shown.

Contents of the manual

The chapters of the manual are briefly described below.

Safety instructions give safety instructions for the installation, commissioning, operation and maintenance of the inverter.

Introduction to the manual introduces the manual.

Operation principle and hardware description describes the operation principle and construction of the inverter in short.

Mechanical installation describes the mechanical installation procedure of the inverter.

Planning the electrical installation contains the instructions that you must follow when selecting the cables, protections, cable routing and way of operation for the inverter system.

Electrical installation describes the electrical installation process of the inverter.

Installation checklist contains a list for checking the mechanical and electrical installation of the inverter.

Start-up describes the start-up procedure of the inverter.

Fault tracing describes the fault tracing possibilities of the inverter.

Maintenance contains preventive maintenance instructions of the inverter.

Technical data contains the technical data for the inverter.

Dimension drawings contains example dimension drawings of the inverter.

Related documents

See the inside of the front cover.

Categorization by frame size and option code

Some instructions, technical data, dimensions and weights which concern only certain inverter frame sizes are marked with the symbol of the frame size, such as R8i. The frame size is not marked on the inverter designation label. To identify the frame size of your unit, see the rating tables in chapter *Technical data*.

The instructions and technical data which concern only certain optional selections are marked with option codes, eg, +Q951. The options included in the inverter can be identified from the option codes visible on the type designation label. The option selections are listed in section *Type designation key* on page *40*.

Quick installation, commissioning and operation flowchart

Task	See
Plan the installation. Check the ambient conditions, ratings, required cooling air flow, input and output power connection, compatibility with the solar generator and other technical data. Select the cables.	*Technical data* *Planning the electrical installation* Option manual (if optional equipment is included)
↓	
Unpack and check the units. Check that all necessary optional modules and equipment are present and correct. Only intact units may be started up.	*Moving the unit (*page *45*). If the converter has been non-operational for more than one year, the converter DC link capacitors need to be reformed. See *Capacitor reforming instructions* (3BFE64059629 [English]).
↓	
Check the installation site.	*Checking the installation site (*page *43*). *Technical data*
↓	
Route the cables.	*Routing the cables* (page *58*)
↓	

Task	See
Install the inverter. Connect the power cables. Connect the control and the auxiliary control cables.	*Mechanical installation* (page *43*), *Electrical installation* (page *65*)
Check the installation.	*Installation checklist* (page *75*)
Commission the inverter.	*Start-up* (page *77*), *PVS800 central inverters firmware manual* (3AUA0000058422 [English])

Terms and abbreviations

Term/ Abbreviation	Explanation
APBU	Optical branching unit for fiber links that use the PPCS protocol. The unit is used for connecting parallel-connected inverter modules to the RDCU.
DDCS	Distributed drives communication system; a protocol used in optical fiber communication inside and between ABB drives and inverters.
EMC	Electromagnetic compatibility
Frame (size)	Relates to the construction type of the component in question. The term is often used in reference to a group of components that share a similar mechanical construction. To determine the frame size of a component, refer to the rating tables in chapter *Technical data*.
IGBT	Insulated gate bipolar transistor; a voltage-controlled semiconductor type widely used in inverters due to its easy controllability and high switching frequency.
Inverter	A cabinet-built entity containing all inverter modules together with their control electronics, and I/O and auxiliary components. The inverter module converts the DC voltage to AC voltage. Its operation is controlled by switching the IGBTs.
I/O	Input/Output
MCB	Miniature circuit breaker
MPPT	Maximum power point tracking. Inverter software function that automatically operates the photovoltaic generator at its maximum power point.
NAMU	Auxiliary measuring unit
NETA	Ethernet adapter module
Photovoltaic cell, generator, module, string, array and array junction box	In this manual, solar power system components based on photovoltaic effect are called solar cell, solar module, solar array, solar string and solar array junction box as defined below.
PGND	Grounding monitoring board
PLC	Programmable logic controller
PPCS	Power plate communication system; a protocol used in the optical fiber link that controls the output semiconductors of an inverter module
Solar array	Group of parallel-connected solar strings
Solar array junction box	Device that connects outputs of multiple solar source circuits (strings) into a combined output circuit or circuits

Term/ Abbreviation	Explanation
Solar cell	Device that converts light directly into electricity by the photovoltaic effect
Solar generator	The total of all solar strings of a solar power supply system, which are electrically interconnected
Solar module	Packaged interconnected assembly of solar cells
Solar string	Circuit of series-connected solar modules
RDCO	DDCS communication module that can be snapped on the RMIO board to add the available fibre optic channels
RDCU	Control unit. The RDCU is a separate unit consisting of an RMIO board built in a plastic housing.
RFI	Radio-frequency interference
RMIO	Control and I/O board. Contains the principal inputs and outputs of the inverter.
RUSB	USB-DDCS adapter for connecting the DriveWindow PC tool to the inverter. The adapter is connected to the USB port of the PC and to the fiber optic channel of the RDCO.
THD	Total harmonic distortion

3

Operation principle and hardware description

What this chapter contains

This chapter describes the operation principle and construction of the inverter in short.

Product overview

The PVS800-57 is a central inverter for converting, adjusting and conveying power generated by a solar generator to the electrical power system.

The inverter is built in an air-cooled cabinet for indoor use. Cooling air is let in through the gratings at the lower part of the cabinet door. The air outlet is at the cabinet roof.

PVS800-57-0100kW

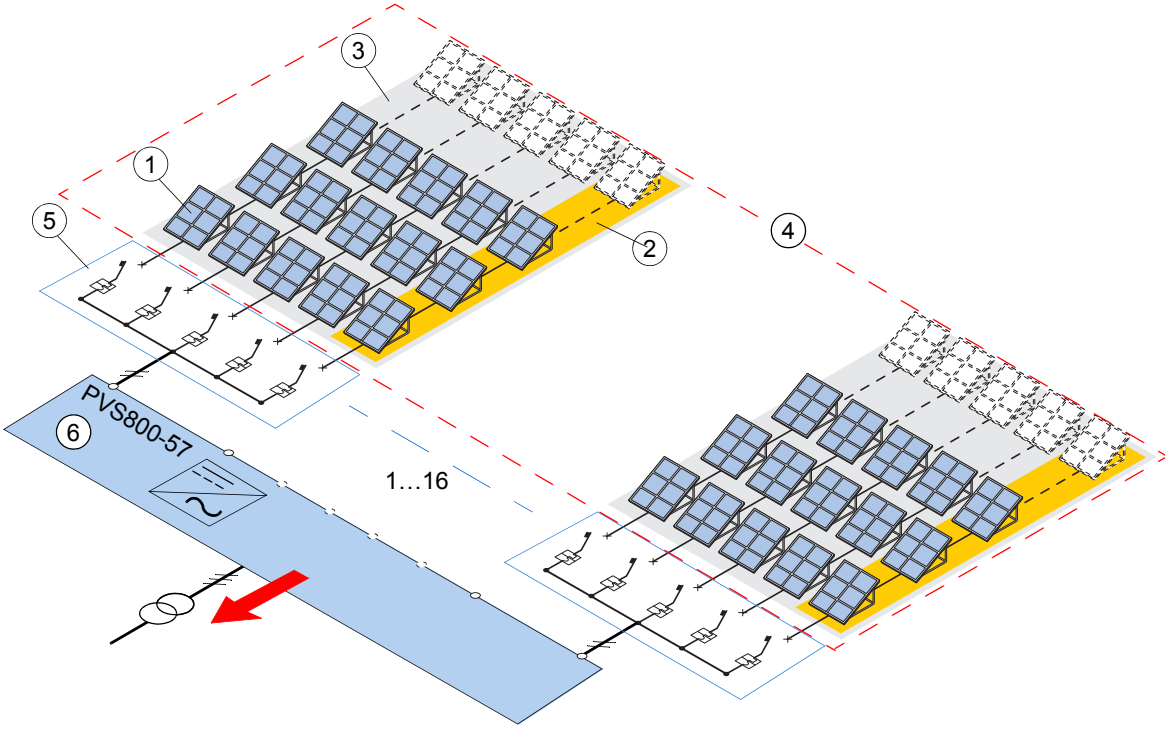
PVS800-57-0250kW and PVS800-57-0315kW

PVS800-57-0500kW and PVS800-57-0630kW

As standard, the solar generator is connected to the DC input terminals of the inverter with busbars and fuse links. Option (+H377) provides miniature circuit breakers for connecting solar array junction boxes.

Block diagram of solar generator system

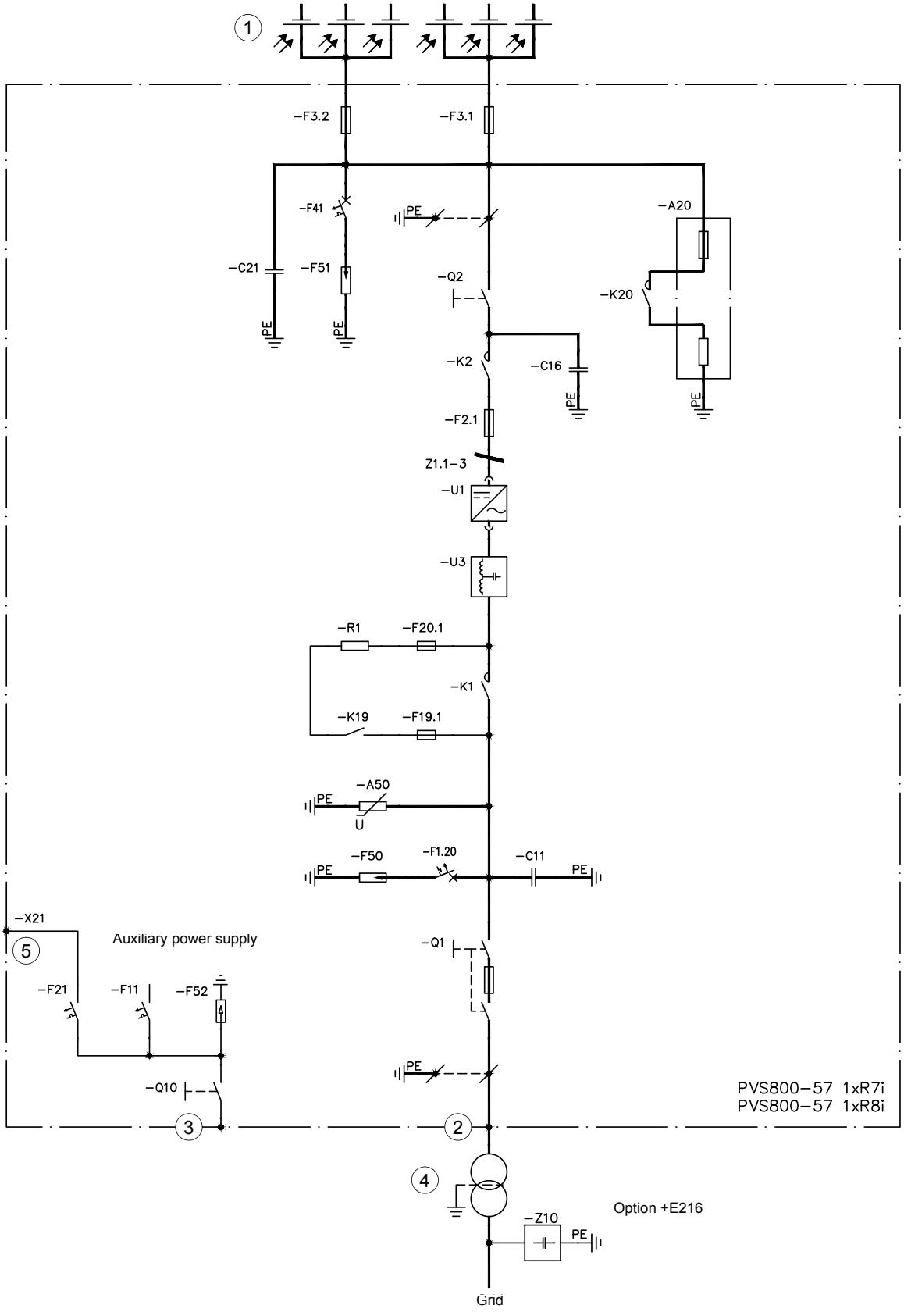
A block diagram of a solar generator system where the solar module string arrays are connected to the electrical power system through an inverter is shown below.



1 Solar module (photovoltaic module)
2 Solar string
3 Solar array
4 Solar generator
5 Solar array junction box
6 Inverter

Main circuit diagram of the inverter system

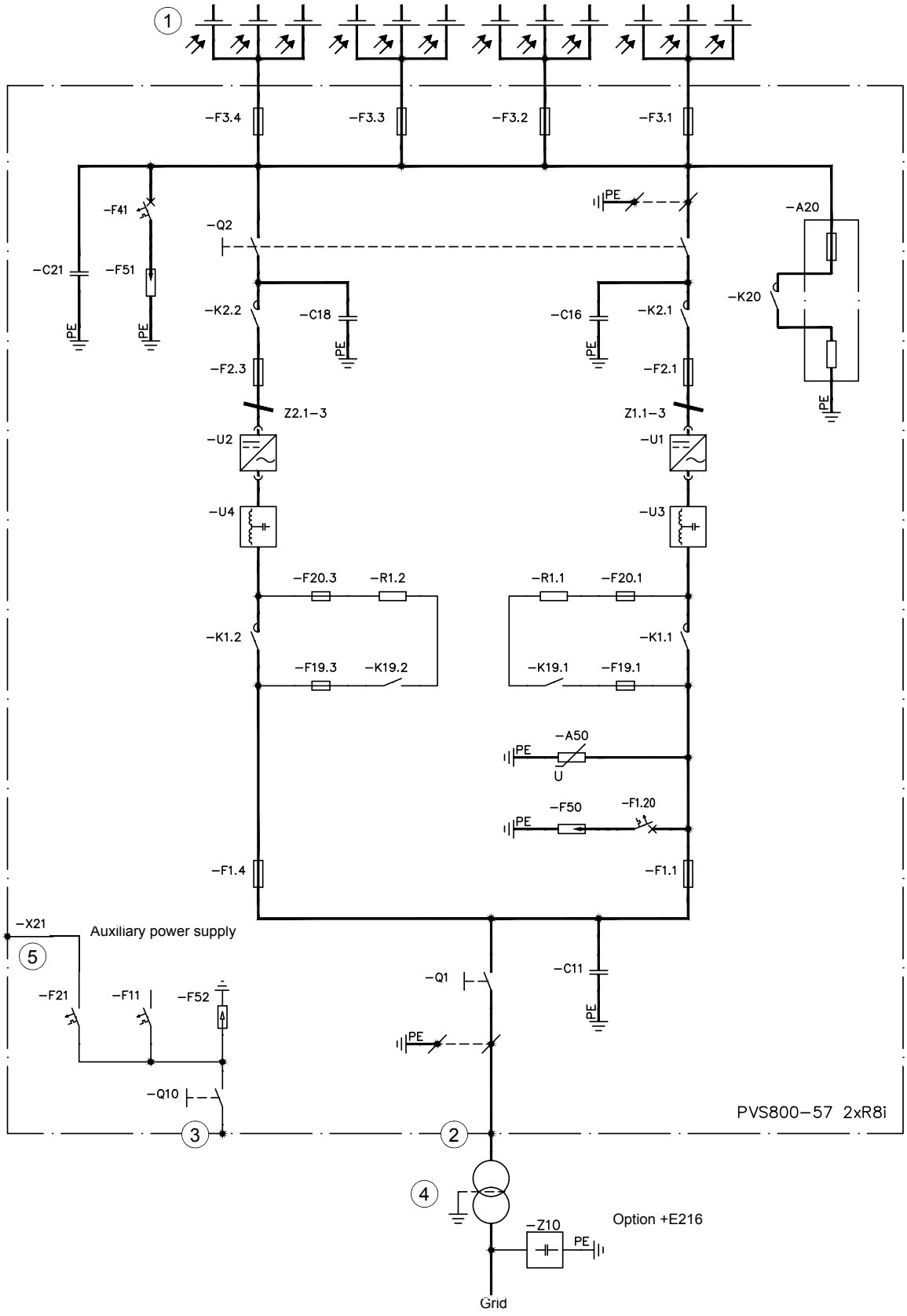
An example main circuit diagram of the 100 kW, 250 kW and 315 kW inverter systems is shown below.



Symbol	Terminal/ Component	Description/Operation
1	DC input terminals	The solar generator is connected to the inverter DC input terminals with busbars and fuse links, or through miniature circuit breakers (option +H377).
2	AC output	The AC output terminals connect the inverter to the low-voltage AC power system.
3	Auxiliary control voltage input	The customer supplies 230 V AC 1-phase auxiliary control voltage to the inverter circuit boards, cooling fan(s) and contactor control circuits.
4	Transformer	The transformer connects the inverter AC side to the low-voltage or medium voltage distribution network.
5	Junction box power supply (option +G410)	The inverter supplies power to the junction box through terminal X21. Max 6 A. Fault current protected.
C11 C16 C21	EMC filter capacitor	Reduces electromagnetic interference. C16 only in 250 kW units.
F3.x	Input DC fuses	Protect the DC input connections. The exact number of the fuses depends on the number of the DC input connections. **Note:** These fuses are not used with option +H377.
F1.20 F41	Circuit breakers	Circuit breakers for overvoltage protection devices F50 and F51.
Q2	DC main switch	Hand-operated switch which connects the inverter to the solar generator. The switch is interlocked with the DC contactor so that it will not open unless the DC contactor is open. If there is no auxiliary power in the inverter, the switch cannot be operated at all. It will remain in the position where it already is.
K2	DC contactor	The inverter controls the DC contactor according to the operational state. The solar generator is disconnected from the inverter when needed.
F2.1	Inverter DC fuses	Protect the inverter module.
Z1.1-3	Common mode filter	Reduces common mode voltages and currents in the solar generator and inverter main circuit and AC output.
F50 F51 F52	Overvoltage protection devices (F50 is optional, +F263)	Devices for overvoltage protection against for example climatic overvoltages caused by lightning strikes.
U1	Inverter module	Converts the DC voltage to AC voltage. The operation is controlled by switching the IGBTs.
U3	LCL filter	Smooths the current and voltage waveform.
K1	AC contactor	The inverter controls the AC contactor according to the operational state.

Symbol	Terminal/ Component	Description/Operation
K19 R1 F19.1 F20.1	Charging circuit	The inverter controls the charging contactor after receiving a start command.
K20	Grounding contactor (with options +F282 and +F283)	The inverter software controls the disconnection of the positive/ negative pole grounding.
A20	Grounding board (with options +F282 and +F283)	Provides fuse protection and current monitoring.
A50	Varistors	For overvoltage protection
Q1	AC main switch	Hand-operated switch which connects the inverter to the electrical power system. The switch includes AC main fuses. The AC main switch can be operated at all times. If it is operated during operation, the inverter will trip as the grid disappears.
Q10	Auxiliary control voltage switch	Hand-operated switch which connects the auxiliary control voltage to the inverter.
Z10	EMC filter	Optional EMC filter (+E216) for low voltage distribution networks.

An example main circuit diagram of the 500 kW and 630 kW inverter systems is shown below.



Symbol	Terminal/ Component	Description/Operation
1	DC input terminals	The solar generator is connected to the inverter DC input terminals with busbars and fuse links, or through miniature circuit breakers (option +H377).
2	AC output	The AC output terminals connect the inverter to the low-voltage AC power system.
3	Auxiliary control voltage input	The customer supplies 230 V AC 1-phase auxiliary control voltage to the inverter circuit boards, cooling fan(s) and contactor control circuits**.**
4	Transformer	The transformer connects the inverter AC side to the low-voltage or medium voltage distribution network.
5	Junction box power supply (option +G410)	The inverter supplies power to the junction box through terminal X21. Max 6 A. Fault current protected.
C11 C16 C18 C21	EMC filter capacitor	Reduces electromagnetic interference.
F3.x	Input DC fuses	Protect the DC input connections. The exact number of the fuses depends on the number of the DC input connections. **Note:** These fuses are not used with option +H377.
Q2	DC main switch	Hand-operated switch which connects the inverter to the solar generator. The switch is interlocked with the DC contactor so that it will not open unless the DC contactor is open. If there is no auxiliary power in the inverter, the switch cannot be operated at all. It will remain in the position where it already is.
K2.1 K2.2	DC contactors	The inverter controls the DC contactor according to the operational state. The solar generator is disconnected from the inverter when needed.
F2.1 F2.3	Inverter DC fuses	Protect the inverter module.
Z1.1-3	Common mode filter	The filter reduces common mode voltages and currents in the solar generator and inverter main circuit and AC output.
U1 U2	Inverter module	Converts the DC voltage to AC voltage. The operation is controlled by switching the IGBTs.
U3 U4	LCL filter	Smooths the current and voltage waveform.
K1.1 K1.2	AC contactors	The inverter controls the AC contactor according to the operational state.
K19.1 K19.2 R1.1 R1.2 F19.1 F19.3 F20.1 F20.3	Charging circuit	The inverter controls the charging contactors after receiving a start command.

Symbol	Terminal/ Component	Description/Operation
F1.1 F1.4	AC fuses	-
F1.20 F41	Circuit breakers	Circuit breakers for overvoltage protection devices F50 and F51.
F50 F51 F52	Overvoltage protection devices (F50 is optional, +F263)	Devices for overvoltage protection against for example climatic overvoltages caused by lightning strikes.
K20	Grounding contactor (with options +F282 and +F283)	The inverter software controls the disconnection of the positive/ negative pole grounding.
A20	Grounding board (with options +F282 and +F283)	Provides fuse protection and current monitoring.
A50	Varistors	For overvoltage protection
Q1	AC main switch	Hand-operated switch which connects the inverter to the electrical power system. The switch includes AC main fuses. The AC main switch can be operated at all times. If it is operated during operation, the inverter will trip as the grid disappears.
Q10	Auxiliary control voltage switch	Hand-operated switch which connects the auxiliary control voltage to the inverter.
Z10	EMC filter	Optional EMC filter (+E216) for low voltage distribution networks.

Electrical power network supervision function

The inverter control program includes an electrical power network supervision function. The inverter monitors, for example, the electrical power system overvoltage, undervoltage, overfrequency, underfrequency and frequency change rate. The function is used for disconnecting the inverter from the power system in power system fault situations. The disconnecting times and frequency limits depend on the owner of the power system and local legislation.

The inverter also provides the electrical power network supervision function with certified monitoring relays (options +Q969 and +Q974).

Positive or negative pole grounding (options +F282 and +F283)

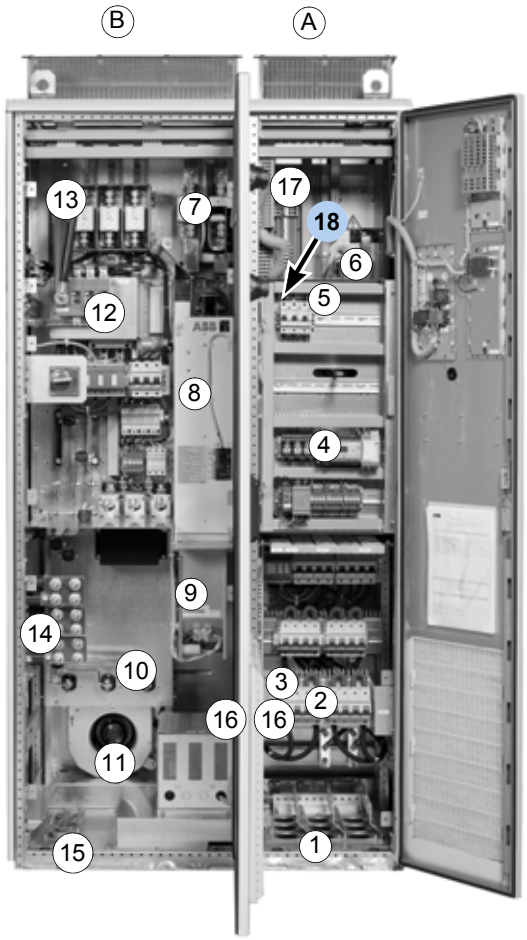
The positive and negative pole grounding options can be used when solar modules require grounding of inverter DC poles. The grounding of the poles complies with standard IEC 62109-2. The grounding is always connected when auxiliary power is connected, except when the automatic photovoltaic generator insulation check is done before the inverter starts.

The grounding wire is protected by a fuse on the PGND-02 board. Due to personnel protection reasons, the grounding is disconnected when sudden level changes are monitored from the grounding wire current.

The grounding resistance can be adjusted by the user during the start-up.

Cabinet layout of frame R7i

A cabinet of frame R7i is shown below with doors open and shrouds removed.



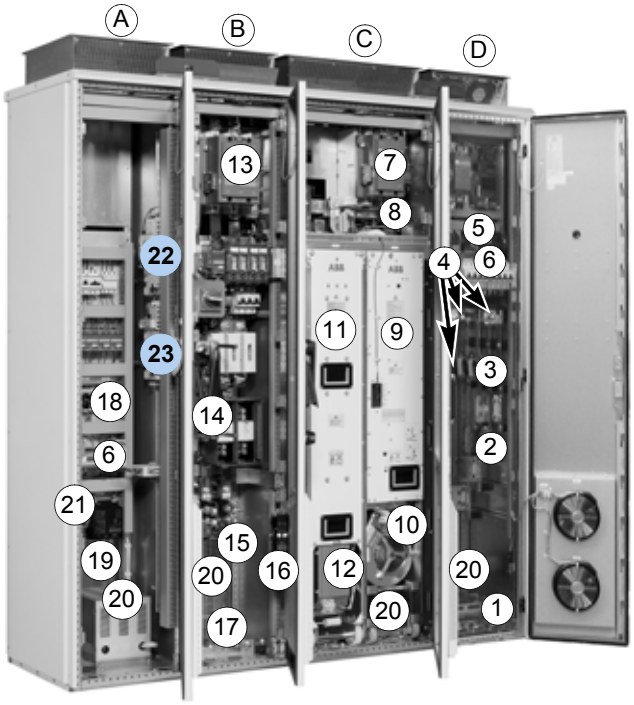
	Description
A	Incoming cubicle
B	Inverter module cubicle
1	DC cable lead-throughs
2	Photovoltaic generator connection terminals
3	Auxiliary control voltage connection terminals and switch
4	Ground fault monitoring device (option +Q954)
5	Grid monitoring relay (options +Q969 and +Q974)
6	DC contactor
7	Inverter DC fuses
8	Inverter module
9	Inverter module cooling fan
10	LCL filter
11	LCL filter cooling fan
12	AC contactor
13	AC main switch
14	AC output (grid connection) terminals
15	AC output cable lead-throughs
16	Heating resistor (option +G300)
17	Junction box power supply (option +G410)

18

18	External control interfaces (behind the swing-out frame)
1	RDCU Control Unit (A41, inverter control unit)
2	RDCU Control Unit (A43, master control unit)

Cabinet layout of frame R8i

A cabinet of frame R8i is shown below with doors open and shrouds removed.



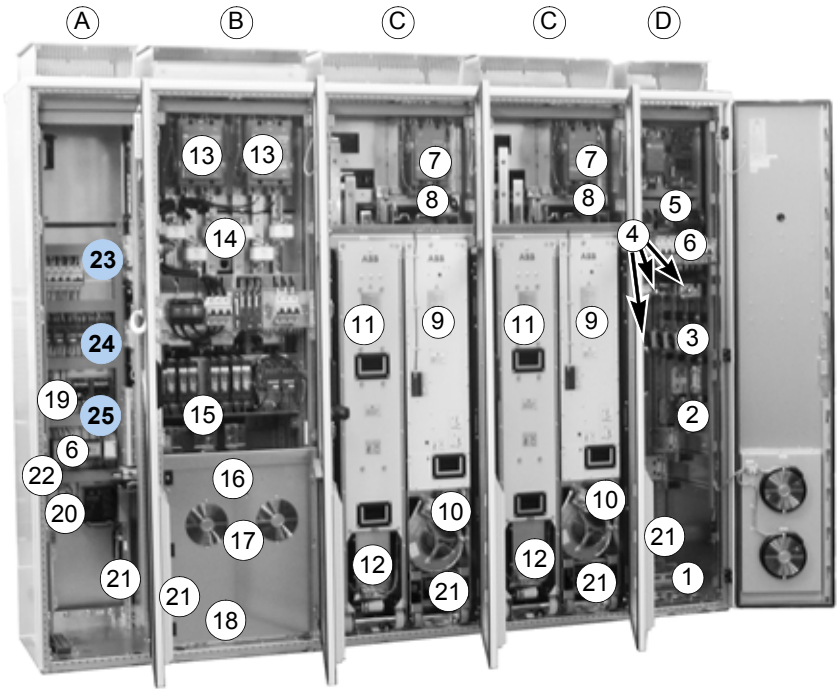
Cubicles	
A	Auxiliary control cubicle
B	Output cubicle
C	Inverter module cubicle
D	Incoming cubicle

External control interfaces	
22	RDCU Control Unit (A41, inverter control unit)
23	RDCU Control Unit (A43, master control unit)

	Description
1	DC cable lead-throughs
2	DC input terminals (fuse protected)
3	Input DC fuses
4	Connecting knobs for temporary grounding of the DC busbars for work
5	DC main switch
6	Ground fault monitoring device (option +Q954)
7	DC contactor
8	Inverter DC fuses
9	Inverter module
10	Inverter module cooling fan
11	LCL filter
12	LCL filter cooling fan
13	AC contactor
14	AC main switch
15	AC output (grid connection) terminals with connecting knobs for temporary grounding for work
16	Cabinet fan
17	AC output cable lead-throughs
18	Grid monitoring relay (options +Q969 and +Q974)
19	115/230 V auxiliary control voltage connection terminals and switch
20	Heating resistor (option +G300)
21	Junction box power supply (option +G410)

Cabinet layout of frame 2 × R8i

A cabinet of frame 2 × R8i is shown below with doors open, shrouds removed and cabinet fan swing-out frame opened.



Cubicles	
A	Auxiliary control cubicle
B	Output cubicle
C	Inverter module cubicle
D	Incoming cubicle

External control interfaces	
23	RDCU Control Unit (A41, inverter control unit)
24	RDCU Control Unit (A43, master control unit)
25	APBU Branching Unit

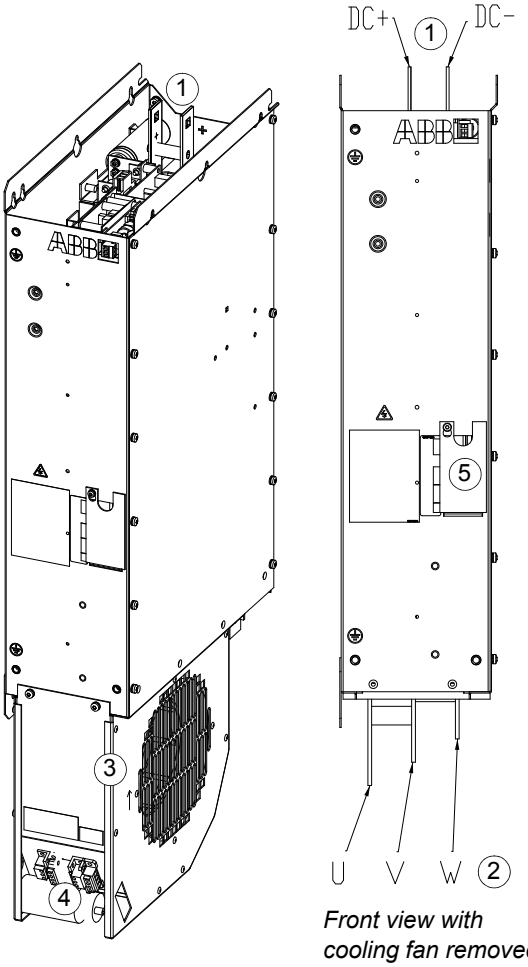
	Description
1	DC cable lead-throughs
2	DC input terminals (fuse protected)
3	Input DC fuses
4	Connecting knobs for temporary grounding of the DC busbars for work
5	DC main switch
6	Ground fault monitoring device (option +Q954)
7	DC contactor
8	Inverter DC fuses
9	Inverter module
10	Inverter module cooling fan
11	LCL filter
12	LCL filter cooling fan
13	AC contactor
14	AC fuses
15	AC main switch
16	AC output (grid connection) terminals (behind the fan swing-out frame) with connecting knobs for temporary grounding for work
17	Cabinet fans
18	AC output cable lead-throughs (behind the fan swing-out frame)
19	Grid monitoring relay (options +Q969 and +Q974)
20	115/230 V auxiliary control voltage connection terminals and switch
21	Heating resistor (option +G300) (The output cubicle heating resistor is behind the fan swing-out frame)
22	Junction box power supply (option +G410)

Door devices

As standard, the cabinet door is equipped with an inverter control panel and AC and DC main switch operating handles. Optionally, the door can also be equipped with emergency stop push and reset buttons and ground fault monitoring indication and reset buttons.

Inverter module (R7i)

The cooling fan at the base of the inverter module is fed from the auxiliary voltage supply.



Front view with cooling fan removed

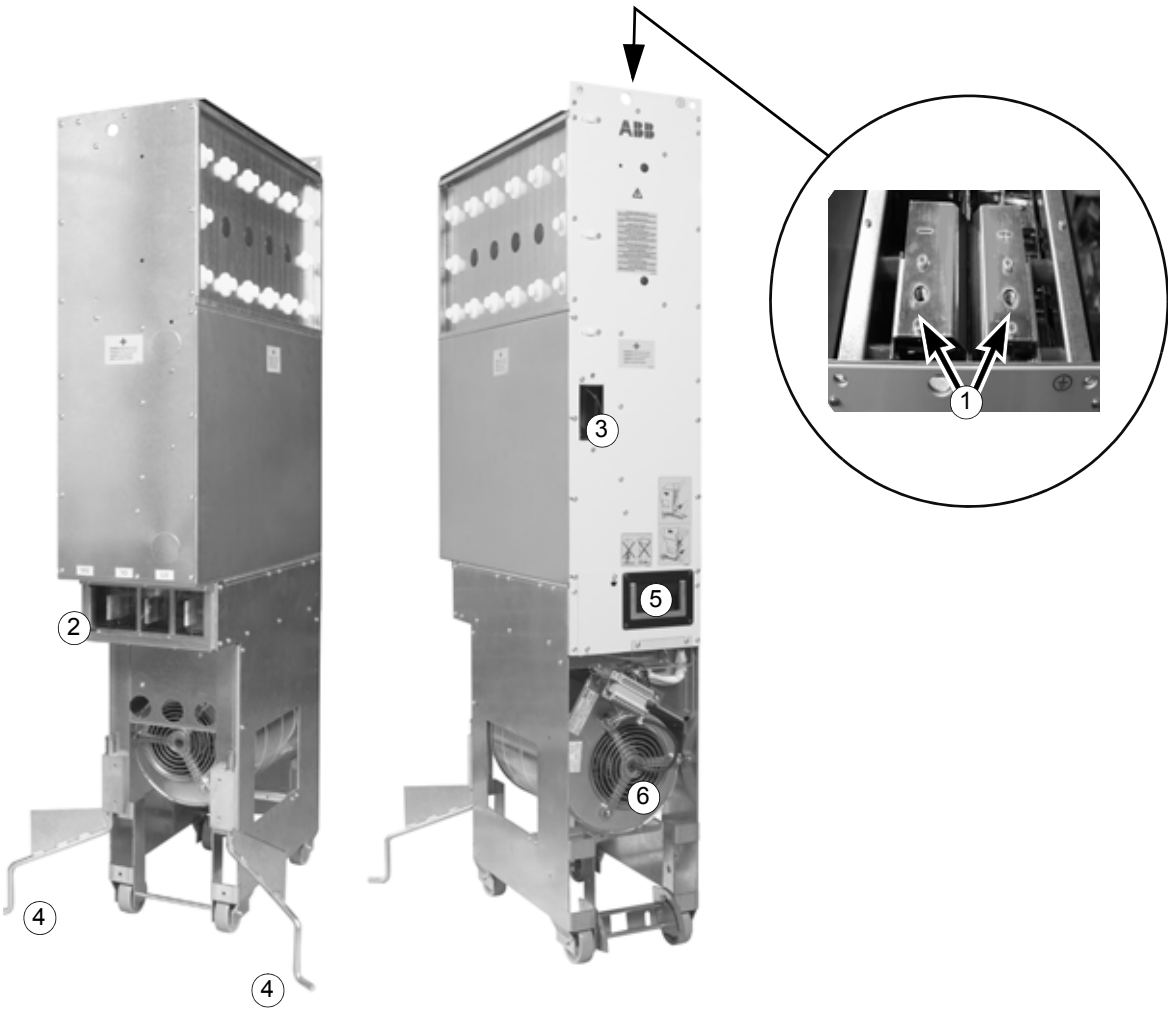
	Description
1	DC (input) connections
2	Output busbars
3	Cooling fan
4	Power connection for cooling fan (X41)
5	Fiber optic connectors

Inverter module (R8i)

The modules run on wheels, which, along with the quick connector at the AC output, enable quick replacement of a module for maintenance.

The inverter module is equipped with a speed-controlled cooling fan involving a power supply board and a fan inverter board that outputs a frequency in the range of 25 to 55 Hz to the fan. The fan is regulated according to the temperature of the output stage of the module. Through inverter parameters, other operating modes, such as constant speed,

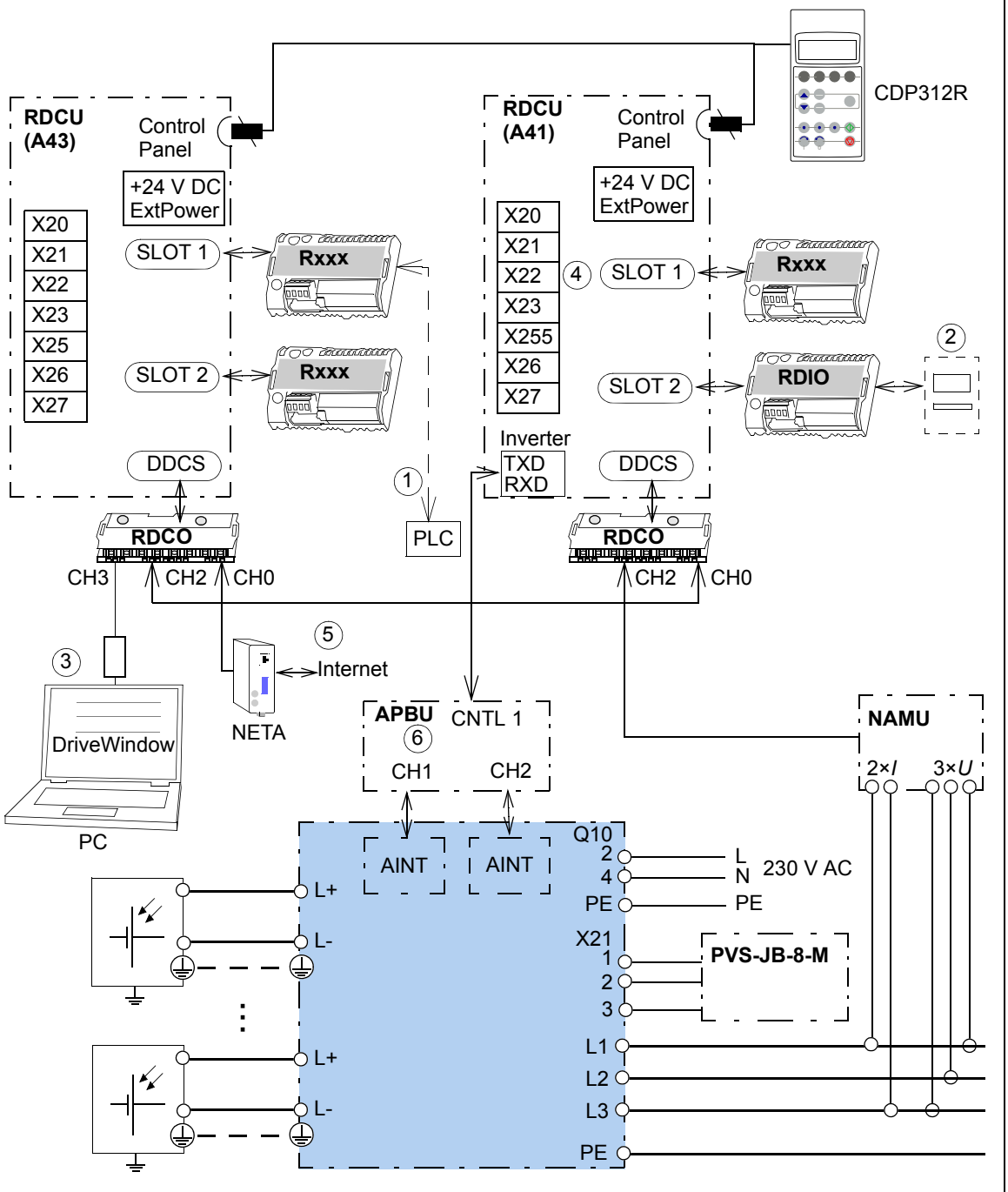
may also be available; see the firmware manual. The power to the fan is supplied from the intermediate DC circuit.



Item	Explanation
1	DC (input) connections
2	AC output busbars. They match the quick connector socket mounted in the cubicle.
3	Fiber optic connectors of the AINT board. Connected to the RDCU control unit.
4	Retractable support legs
5	Handle
6	Cooling fan

Connections and interfaces overview

The diagram below shows the power connections and control interfaces of the inverter.



[1] Monitoring and/or controlling of the inverter; [2] Grid monitoring relay (option +Q969 or +Q974); [3] See page *74*; [4] Ground fault monitoring (option +Q954)

[5] Remote monitoring (default connection). For ring topology, see the firmware manual for the required parameter settings.

[6] APBU branching unit and two AINT boards only in frames 2 × R8i. In other frames the fiber optic cables from A41 are connected directly to AINT.

See the next page for other descriptions. See chapter *Electrical installation* for the wiring instructions and section *Control unit (RDCU/RMIO) connection data* on page *108* for the control unit specifications. For more information on the connections, see the circuit diagrams delivered with the inverter.

Device	Description
RDCU (A43)	**Master control unit equipped with the RMIO board containing the PVS800 solar inverter master control program.**
Terminal block	
X20, X21	Reference voltage ±10 V DC
X21	Analog inputs (3 pcs) and outputs (2 pcs)
X22	Digital inputs (7 pcs)
X23	Auxiliary voltage output and input 24 V DC
X25 to X27	Relay outputs (3 pcs)
+24 V DC ExtPower	External power input
Slot 1	
Rxxx-0x	Fieldbus adapter module RETA-01, RETA-02, RPBA-01 or RMBA-01
Slot 2	
Rxxx-0x	Reserved for string monitoring (option +K479).
DDCS	
RDCO-0x	DDCS communication adapter module
PC	For using the inverter PC tools
NETA-0x	Ethernet adapter module for Internet browser-based remote monitoring of the inverter
RDCU (A41)	**Inverter control unit equipped with the RMIO board containing the PVS800 solar inverter control program.**
Terminal block	
X20, X21	Reference voltage 24 V DC
X21	Analog inputs and outputs (5 pcs) Reserved. Contact ABB, if need to be used.
X22	Digital inputs (7 pcs), one input reserved for the optional ground fault monitoring
X23	Auxiliary voltage output and input 24 V DC
X25 to X27	Relay outputs (3 pcs)
+24 V DC ExtPower	External power input
SLOT 1 (This slot is reserved in 2×R8i units.)	
SLOT 2	
RDIO-01	Reserved for inverter control and grid monitoring relay signals.
DDCS	
RDCO-01	DDCS communication adapter module

CDP-312R Control Panel

The CDP-312R is the user interface of the inverter unit, providing the essential controls such as Start/Stop/Reset/Reference, and the parameter settings for the inverter control programs. The control panel is connected to the RDCU units. For how to use the control panel, refer to the firmware manual.

Circuit boards

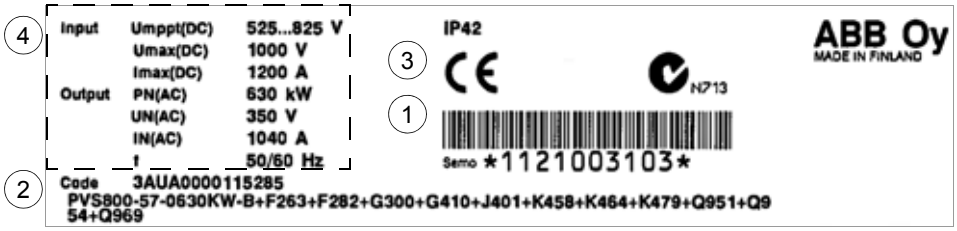
The inverter contains the following printed circuit boards as standard:

- main circuit board (AINT)
- control and I/O board (RMIO) inside the RDCU Control Unit
- power supply board (APOW)
- gate driver control board (AGDR)
- diagnostics and panel interface board (ADPI)
- measuring board (NAMU)

Type designation labels

Inverter label

The type designation label of the inverter includes an IEC rating, CE and other markings, a type designation and a serial number, which allow individual recognition of each unit. The type designation label is located on the front cover of the inverter cabinet. An example label is shown below.

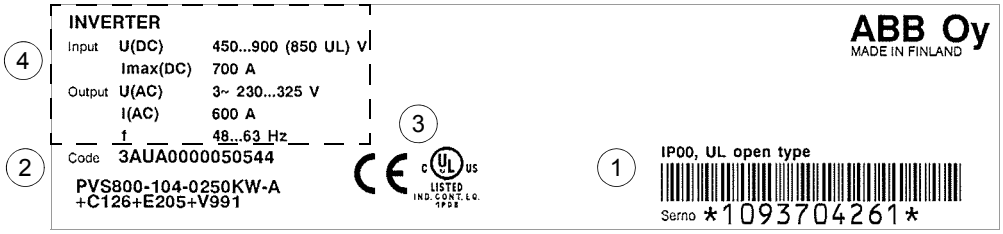


No.	Description
1	Serial number. The first digit of the serial number refers to the manufacturing plant. The next four digits refer to the unit's manufacturing year and week, respectively. The remaining digits complete the serial number so that there are no two units with the same number.
2	Type designation, see section *Type designation key* below.
3	Valid markings
4	Ratings of inverter

Inverter module label

The type designation label of the inverter module includes the ratings, valid markings, a type code and a serial number. The module label is attached to the front panel of the module.

An example type designation label of the inverter module is shown below.



No.	Description
1	Serial number. The first digit of the serial number refers to the manufacturing plant. The next four digits refer to the unit's manufacturing year and week, respectively. The remaining digits complete the serial number so that there are no two modules with the same number.
2	Type designation
3	Valid markings
4	Ratings of inverter module

Type designation key

The type designation contains information on the specifications and configuration of the inverter. The first digits from left express the basic configuration, eg, PVS800-57-250kW-A. The optional selections are given thereafter, separated by plus signs, eg, +Q951. The main selections are described below. Not all selections are available for all types. For more information, refer to *PVS800-57 ordering information* (3AXD10000021367), available on request.

Selection	Alternatives	
Product series	PVS800 product series (ABB central inverters)	
Type	57	Cabinet-built central inverter. When no options are selected: IP42 (UL Type 2), AC contactor, aR fuses, fuse switch (100 kW, 250 kW and 315 kW), AC side switch disconnector (500 kW and 630 kW), terminals for 230 V AC external control voltage, CDP312 Control Panel, RDIO for internal control, RDCO-03 module for optical communication, EMC filtering, common mode filter, PVS800 solar inverter control programs, bottom entry and exit of cables, coated boards, maximum DC voltage 1000 V DC, ungrounded DC input, IT (ungrounded) AC output, DC input overvoltage and surge protection, AC output overvoltage protection with varistors, AC grounding terminals on output busbars, DC input busbars (1 × DC input connections for 100 kW units, 2 × DC input connections for 250 kW and 315 kW units, 4 × DC input connections for 500 kW and 630 kW units), DC contactor and main switch, DC grounding terminals on input busbars, electrical power network supervision function, electrical power network support functions, a set of manuals, warranty 12/24 months.
Nominal AC power	xxxkW	Refer to the rating tables, page *99*.
Voltage	A	300 V AC (operational [MPPT] DC voltage range 450…825 V DC)
	B	350 V AC (operational [MPPT] DC voltage range 525…825 V DC)
+ options		
Filters	E216	EMC/RFI filter for the network side of the transformer on TN (grounded) low voltage networks

Selection	**Alternatives**	
Cabinet and construction options	C176	Doors with left hinges on the left side
	C177	Golden Sun approved
	C178	VDE approved
	G300	Cabinet heater
	G410	Junction box power supply
	J401	Inverter monitoring display
Line options	F263	Advanced AC output overvoltage and surge protection
	F282	Grounding, positive DC
	F283	Grounding, negative DC
	0F291	No input DC fuses
Cabling	H377	MCB-protected DC input connections: 4 × miniature circuit breakers for 100 kW units, 8 × miniature circuit breakers for 250 kW units, 16 × miniature circuit breakers for 500 kW units
	4H382	4 × fuse-protected DC input connections for 250 kW and 315 kW units
	8H382	8 × fuse-protected DC input connections for 250 kW, 315 kW, 500 kW and 630 kW units
	12H382	12 × fuse-protected DC input connections for 500 kW and 630 kW units
Fieldbus	K454	RPBA-01 PROFIBUS DP adapter module
	K458	RMBA-01 Modbus adapter module (Slot 1)
	K464	NETA-01 Intelligent Ethernet adapter module
	K466	RETA-01 Ethernet/IP™ and Modbus/TCP adapter module
	K467	RETA-02 Ethernet PROFINET IO and Modbus TCP/IP™ adapter module
	K479	RMBA-01 Modbus adapter module for PVS-JB-8-M Junction box interface (Slot 2)
Specialities	P902	Customized (described in Technical appendix)
	P926	Extended warranty 24/30 months
	P927	Extended warranty 36/42 months
	P928	Extended warranty 60/66 months
Safety options	Q951	Emergency stop
	Q954	Ground fault monitoring in IT (ungrounded) systems
	Q969	Grid monitoring relay, ENEL approved
	Q974	Grid monitoring relay, VDE0126 approved
Documentation language	R701	German (delivered set may include manuals in English)
	R702	Italian (delivered set may include manuals in English)
	R707	French (delivered set may include manuals in English)
	R708	Spanish (delivered set may include manuals in English)

4

Mechanical installation

What this chapter contains

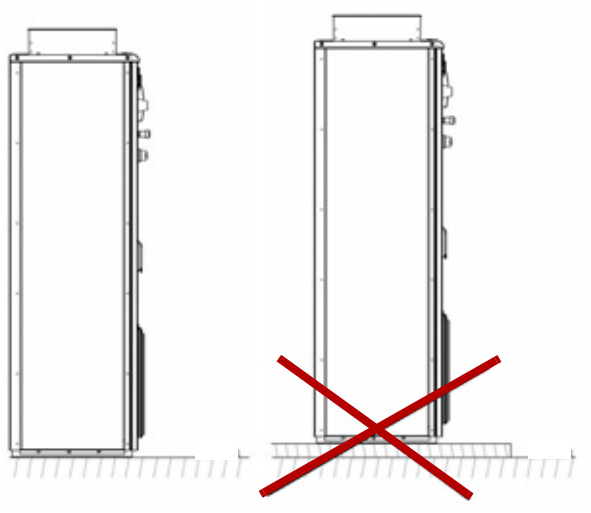
This chapter describes the mechanical installation procedure of the inverter.

Checking the installation site

See section *Ambient conditions* on page *113* for allowable operating conditions, and section *Dimensions, weights and free space requirements* on page *103* for requirements for free space around the unit.

The floor that the unit is installed on must be of non-flammable material, as smooth as possible, and strong enough to support the weight of the unit. The floor flatness must be checked with a spirit level before the installation of the cabinets into their final position. The maximum allowed deviation from the surface level is 5 mm in every 3 metres. The installation site should be levelled, if necessary, as the cabinet is not equipped with adjustable feet.

Note: For easy maintenance, do not install the inverter on a higher level than the floor in front of it. If the inverter is placed higher, the ramp supplied with the inverter cannot be used when replacing an inverter module.



The wall behind the unit must be of non-flammable material.

Required tools

The tools required for moving the unit to its final position, fastening it to the floor and tightening the connections are listed below:

- crane, fork-lift or pallet truck (check load capacity!); iron bar, jack and rollers
- Pozidrive and Torx (2.5–6 mm) screwdrivers for the tightening of the frame screws
- torque wrench
- set of wrenches and sockets.

Checking the delivery

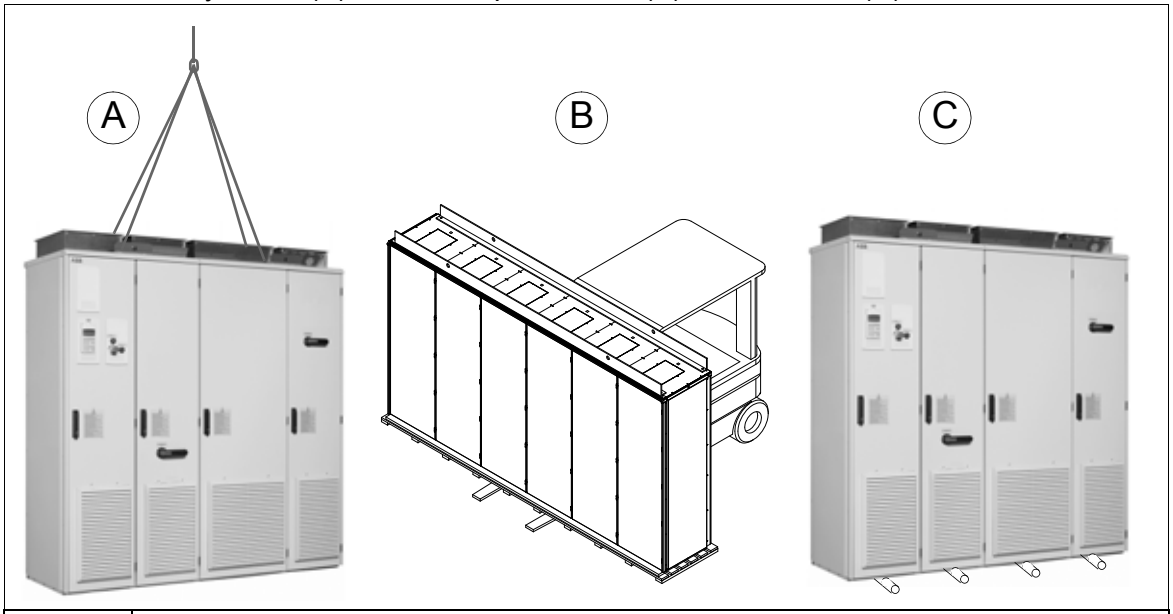
The inverter delivery contains:

- inverter cabinet line-up
- optional modules (if ordered) installed onto the RDCU control units
- ramp for the inverter module replacement (frame R8i)
- appropriate inverter manuals and optional module manuals
- delivery documents.

Check that there are no signs of damage. Manuals and other loose parts are delivered inside the inverter. Before attempting installation and operation, check the information on the type designation label of the inverter to verify that the delivery is of the correct type. See sections *Type designation labels* on page *39* and *Type designation key* on page *40*.

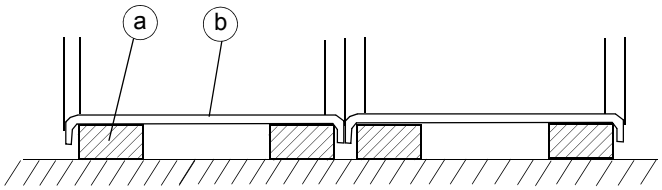
Moving the unit

Move the unit by crane (A), fork-lift or pallet truck (B), or on rollers (C) as shown below.



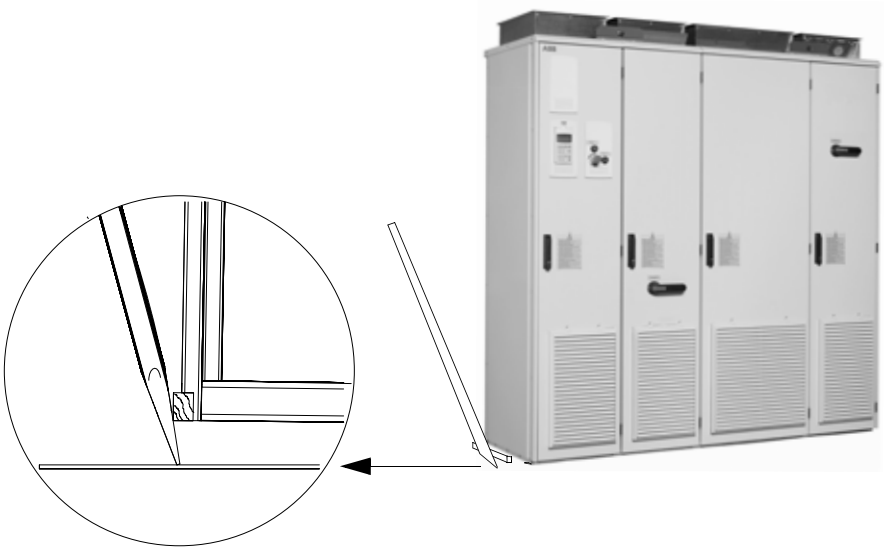
A	Use the steel lifting bars attached to the top of the cabinet. Insert the lifting ropes or slings into the holes of the lifting bars. The lifting bars can be removed (not mandatory) once the cabinet is in its final position. **If the lifting bars are removed, the bolts must be refastened to retain the degree of protection of the cabinet.**
B	The unit is to be moved only in the upright position. The centre of gravity is high. Be therefore careful when transporting the unit. Avoid tilting the cabinet. If using a pallet truck, check its load capacity before attempting to move the unit.

If the cabinet needs to be laid on its back, it must be supported from below beside the cubicle seams as shown below. a) support, b) cabinet back panel. **Note:** Transportation of a unit on its back is only allowed if the unit is equipped for such transportation at the factory.



Placing the unit

Move the cabinet into its final position with an iron bar and a piece of wood at the bottom edge of the cabinet. Place the wooden piece properly in order not to damage the cabinet frame!

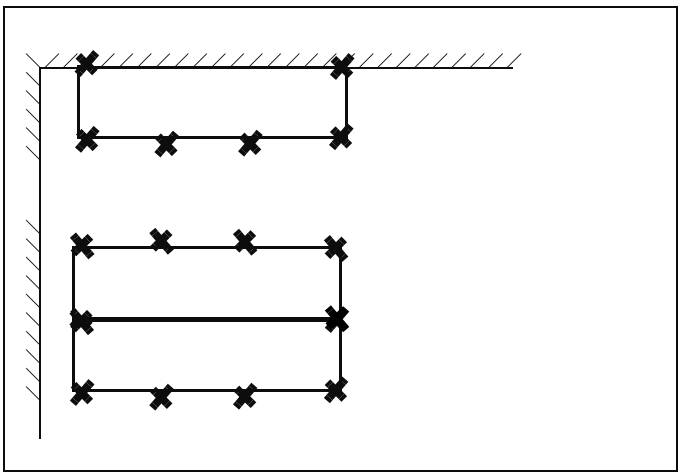


Overview of the installation process

The unit must be installed in an upright vertical position. It can be installed with its back against a wall, or back-to-back with another unit and side by side. Fasten the cabinet to the floor (and roof) as described under *Fastening the cabinet to the floor*, page *47*.

Note 1: Leave required free space around the unit. See page *103*.

Note 2: Height adjustment can be done by using metal shims between the bottom frame and floor.



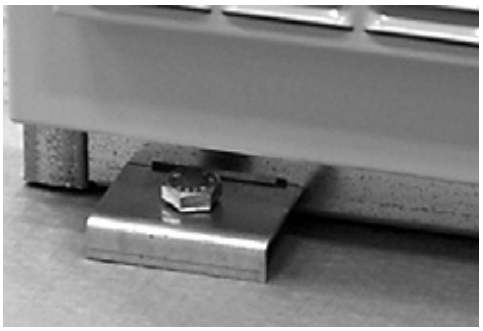
Fastening the cabinet to the floor

The cabinet must be fastened to the floor by using clamps along the edge of the cabinet bottom, or by bolting the cabinet to the floor through the holes inside.

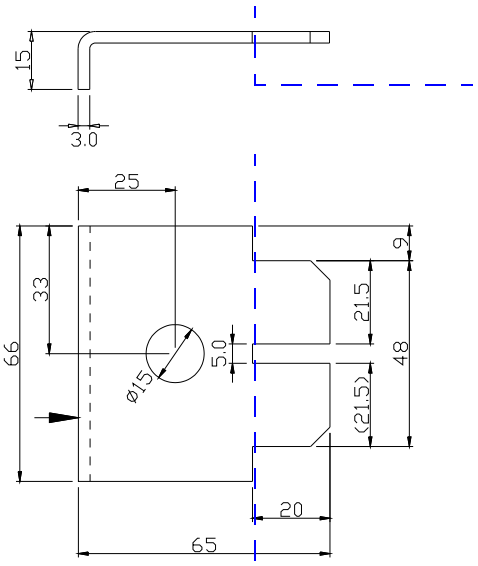
Alternative 1 – Clamping

Insert the clamps into the twin slots along the front and rear edges of the cabinet frame body and fasten them to the floor with a bolt. The recommended maximum distance between the clamps is 800 mm (31.5”).

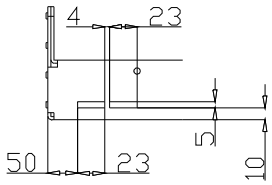
If there is not enough working space behind the cabinet for mounting, fasten the top of the cabinet to the wall with L-brackets (not included in the delivery). Use the lifting bar fastening holes and bolts (M16).



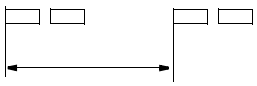
Clamp

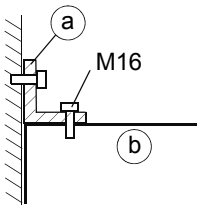


Clamp dimensions in millimetres. The dotted line denotes the cabinet frame.



Slot detail, front view (dimensions in millimetres)

Cubicle width	Distance between slots 
400 mm	250 mm (9.85”)
600 mm	450 mm (17.7”)
800 mm	650 mm (25.6”)

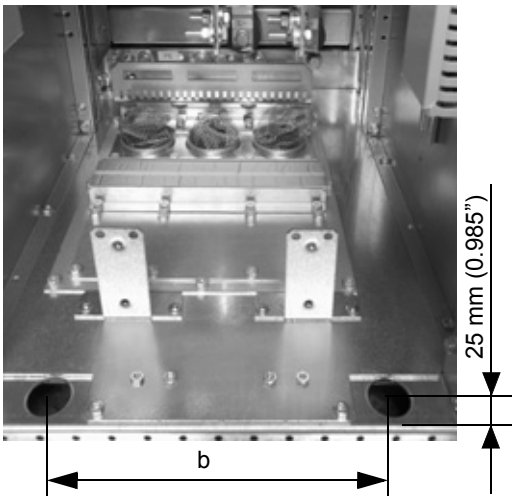


Fastening the cabinet at the top with L-brackets (side view)
a) L-bracket
b) Cabinet roof

Alternative 2 – Using the holes inside the cabinet

The cabinet can be fastened to the floor using the fastening holes inside the cabinet, if they are accessible. The recommended maximum distance between the fastening points is 800 mm (31.5”).

If the back fastening holes are not accessible, fasten the top of the cabinet to the wall with L-brackets (not included in the delivery). Use the lifting bar fastening holes and bolts (M16).

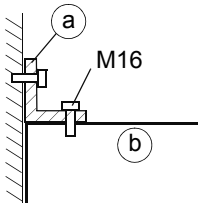


Fastening holes inside the cabinet.

a) Cubicle width

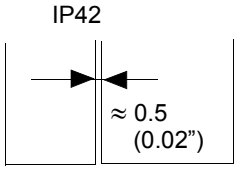
b) Distance between fastening holes. Outer hole diameter 31 mm (1.22”). Bolt size: M16

a (mm)	**b**
400	250 mm (9.85”)
600	450 mm (17.7”)
800	650 mm (25.6”)



Fastening the cabinet at the top with L-brackets (side view)
a) L-bracket
b) Cabinet roof

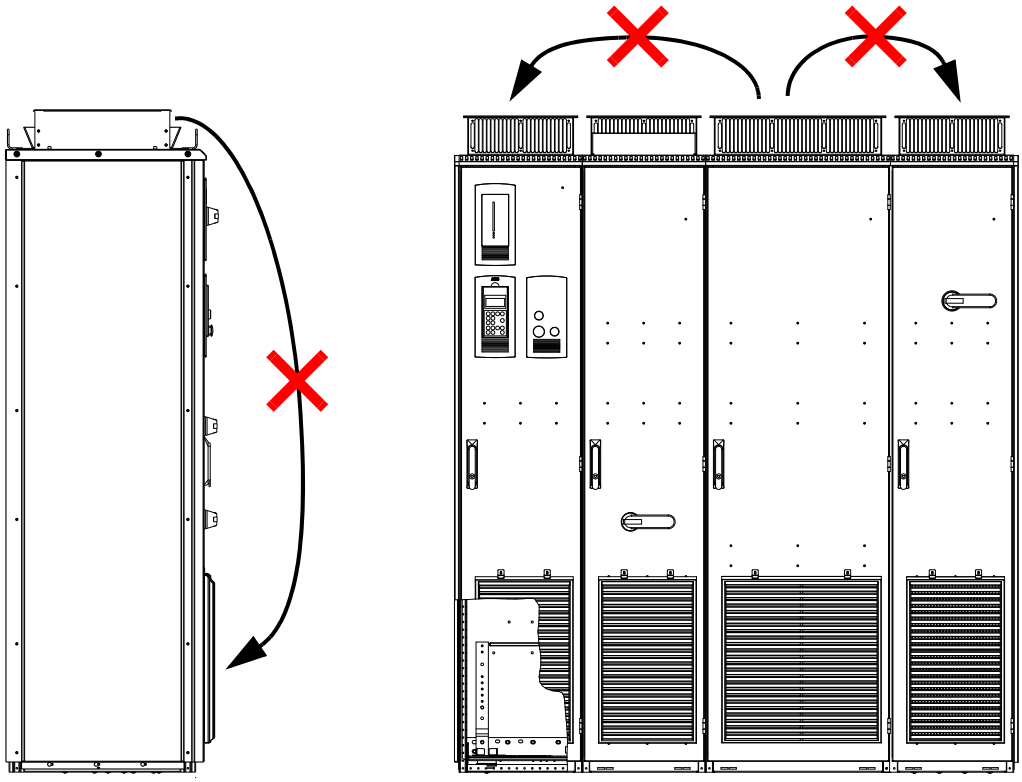
Added width:
Side panels of the cabinet: 15 mm (0.6”)
Back panel of the cabinet: 10 mm (0.4”)
Gap between cubicles (mm):



Miscellaneous

Preventing the recirculation of hot air

Prevent hot air circulation outside the inverter by leading the outcoming hot air away from the area where the inlet air to the inverter is taken. Also, ensure that the hot air from the inverter module cubicle cannot enter the adjacent cubicles.



Ventilation duct at the air outlet of the cabinet

A ventilation duct can be constructed at the air outlet of the inverter cabinet. If an exhaust fan is used, ensure that the capacity is sufficient. See *Losses, cooling data and noise* on page *103.*

Note: The ventilation system must keep the static pressure in the air outlet duct sufficiently below the pressure of the room where the inverter is located in order that the cabinet fans can produce the required air flow through the cabinet. Ensure that no dirty or moist air is able to flow backward to the inverter in any case, even during off-time or while servicing the inverter or the ventilation system.

Calculating the required static pressure difference

The required static pressure difference between the exit air duct and the inverter installation room can be calculated as follows:

$$\Delta p_s = (1.5\ldots2) \bullet p_d$$

where

$$p_d = 0.5 \bullet \rho \bullet v_m^2$$

$$v_m = q / A_c$$

p_d ≙ dynamic pressure

ρ ≙ air density (kg/m^3)

v_m ≙ average air velocity in the exit duct(s) (m/s)

q ≙ rated air flow of the inverter (m^3/s)

A_c ≙ cross-sectional area of the exit duct(s) (m^2)

Example:

The cabinet has 3 exit openings of 315 mm diameter. The rated air flow of the cabinet is 3760 m^3/h = 1.0 m^3/s.

$A_c = 3 \bullet 0.315^2 \bullet \pi / 4 = 0.234$ m^2

$v_m = q / A_c = 1.0 / 0.234 = 4.3$ m/s

$p_d = 0.5 \bullet \rho \bullet v_m^2 = 0.5 \bullet 1.1 \bullet 4.3^2 = 10$ Pa

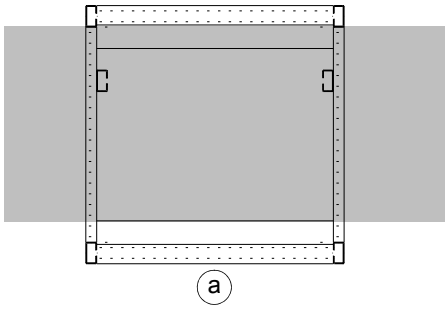
The required pressure in the exit air duct is then, 1.5…2 • 10 Pa = 15…20 Pa, below the pressure in the room.

More information: Contact ABB.

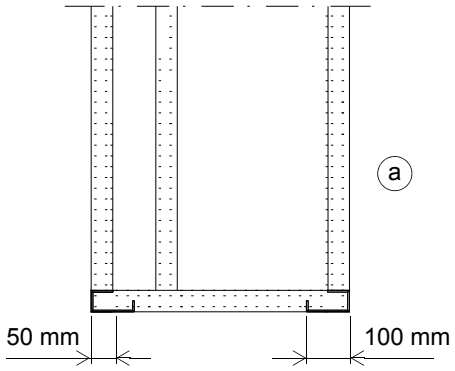
Cable duct in the floor below the cabinet

A cable duct can be constructed below the middle part of the cabinet. The duct width may not exceed 450 mm. The cabinet weight lies on the 100 mm wide section in front and 50 mm wide section on the back which the floor must carry.

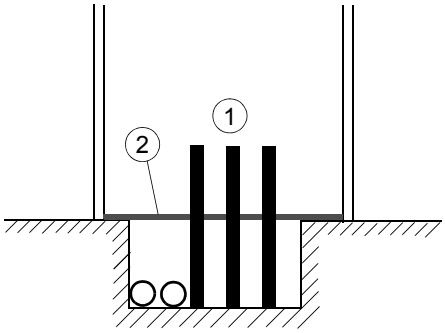
Prevent the cooling air flow from the cable duct to the cabinet by bottom plates. To ensure the degree of protection for the cabinet, use the original bottom plates delivered with the unit. With user-defined cable entries, take care of the degree of protection, fire protection and EMC compliance.



Allowed area for cable duct (view from above). a) Cabinet front. The shaded area can be used for a cable duct.



Minimum widths for the floor support (side view). a) Cabinet front.



Preventing cooling air flow. 1) Cables. 2) Bottom plates.

5

Planning the electrical installation

What this chapter contains

This chapter contains the instructions that you must follow when selecting the cables, transformer, protections, cable routing and way of operation for the inverter system.

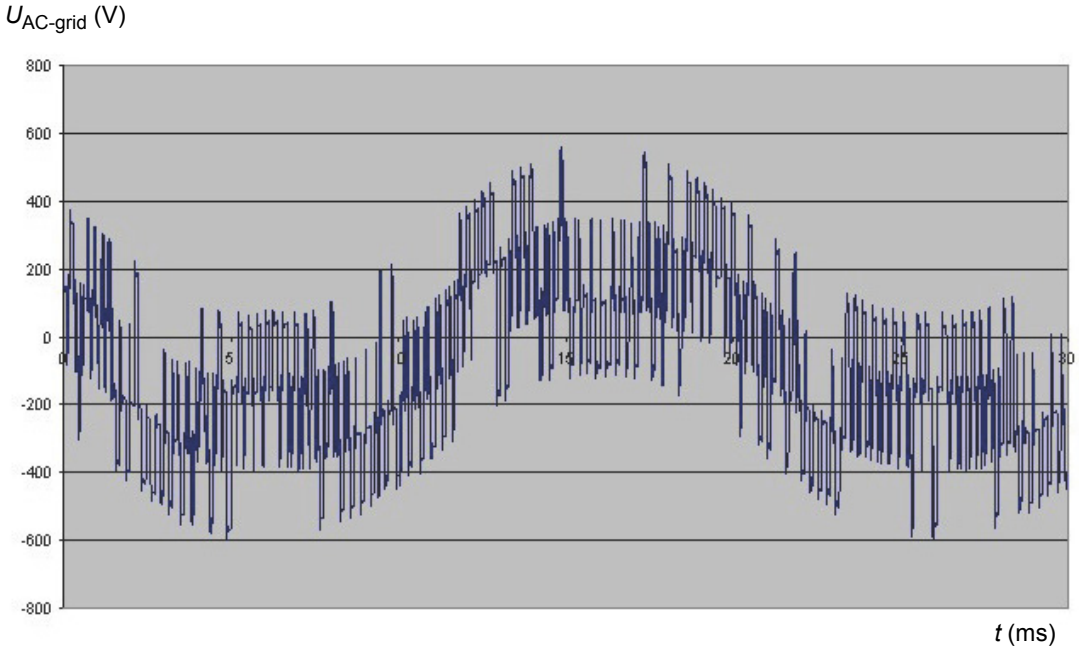
Note: The installation must always be designed and made according to applicable local laws and regulations. ABB does not assume any liability whatsoever for any installation which breaches the local laws and/or other regulations. Furthermore, if the recommendations given by ABB are not followed, the inverter may experience problems that the warranty does not cover.

Selecting the transformer

Transformers designed for photovoltaic applications are available from ABB. Each inverter must be galvanically isolated from other inverters by a dedicated transformer or winding. If you intend to connect inverters in parallel, please contact ABB for more information. ABB recommends a transformer designed for the environment where it will be installed, compliance with power transformer standard IEC 60076 and testing according to converter transformer standard for industrial applications IEC 61378-1. Country-specific requirements must always be fulfilled.

Requirements for the transformer

- suitable for the network and inverter AC voltage, current and power
- suitable for use with IGBT inverters
- degree of protection, temperature limits and lifetime are appropriate for the environment
- equipped with a static grounded screen between the high and low voltage windings
- voltage withstand level of the low voltage winding is at least 1.6 kV against ground. A typical voltage waveform against ground is shown below.



- voltage rise time withstand level (d*u*/d*t*) of the low voltage winding is at least 1000 V per microsecond against ground.
- rated short-circuit impedance (X_k) for each inverter is approximately 6% (±1%)
- withstands low-voltage side current DC components of at least 0.5% of the nominal rated current preferably without using an air gap
- withstands the 3% total harmonic distortion generated by the inverter. However, we recommend dimensioning the transformer for at least 5% total harmonic distortion to withstand possible outside interference from the network.

ABB recommends that the transformer is equipped with an off-load tap changer for voltage regulation on the high-voltage side of the winding with two 2.5% step points to the plus and minus directions.

The inverter does not require any specific transformer notation. ABB recommends using traditional notations, such as Dy11d0, Dy11y11, etc.

Do not ground the neutral (star) point of the transformer or connect it to the neutral points of other windings.

Selecting the grid disconnecting device

The inverter is equipped with a hand-operated disconnecting device which isolates the inverter and the solar generator from the electrical power system. The disconnecting device does not, however, isolate the inverter AC output busbars from the power system. Therefore, during installation and maintenance work on the inverter, the AC output cables and busbars must be isolated from the electrical power system with a disconnector at the transformer.

Selecting the DC input disconnecting device

As standard, the inverter is equipped with a hand-operated disconnecting device. Optionally, it can be equipped with miniature DC input circuit breakers (option +H377). The breakers do not, however, isolate the inverter DC input conductors and terminals from the input voltage. Therefore, the junction boxes must be equipped with breakers for the isolation.

Checking the compatibility of the solar generator and inverter

Check that

- generator current and voltage match the rated values of the inverter
- generator open circuit voltage does not exceed the maximum allowed DC voltage of the inverter
- generator operating range lies between the limits of the maximum power point tracking (MPPT) function of the inverter control program
- generator grounding requirements match with the inverter.

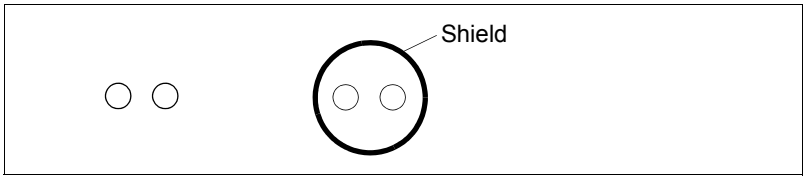
Selecting the power cables

General rules

Dimension the DC input power and AC output power cables **according to local regulations**:

- Dimension the cable to carry the inverter load current. See chapter *Technical data* for the rated currents.
- Select a cable rated for at least 70 °C maximum permissible temperature of conductor in continuous use.
- The inductance and impedance of the PE conductor/cable (grounding wire) must be rated according to permissible touch voltage appearing under fault conditions (so that the fault point voltage will not rise excessively when a ground fault occurs).
- Select an AC output cable rated for at least 600 V AC.

A two-conductor system is allowed for the DC input cabling but a shielded cable can also be used.



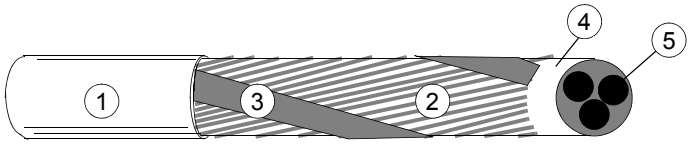
Symmetrical shielded cable is recommended for the AC output cabling; see section *Recommended AC output power cable types* below. Compared to a four-conductor system, the use of symmetrical shielded cable reduces electromagnetic emission of the whole inverter system.

Note: When continuous metal conduit is employed, shielded cable is not required. The conduit must have bonding at both ends as with cable shield.

To operate as a protective conductor, the shield conductivity requirements according to IEC 61439-1 are shown below when the protective conductor is made of the same metal as the phase conductors:

Cross-sectional area of the phase conductors **S (mm^2)**	**Minimum cross-sectional area of the corresponding protective conductor** **S_p (mm^2)**
$S \leq 16$	S
$16 < S \leq 35$	16
$35 < S$	S/2

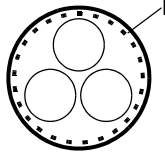
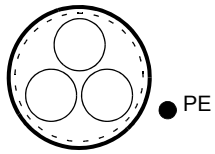
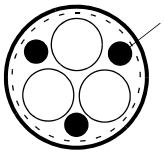
To effectively suppress radiated and conducted radio-frequency emissions, the cable shield conductivity must be at least 1/10 of the phase conductor conductivity. The requirements are easily met with a copper or aluminum shield. The minimum requirement of the cable shield is shown below. It consists of a concentric layer of copper wires with an open helix of copper tape or copper wire. The better and tighter the shield, the lower the emission level and bearing currents.



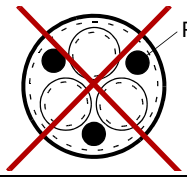
1	Insulation jacket
2	Copper wire screen
3	Helix of copper tape or copper wire
4	Inner insulation
5	Cable core

Recommended AC output power cable types

The power cable types that can be used for the inverter AC output are represented below

	Symmetrical shielded cable with three phase conductors and a concentric PE conductor as shield. The shield must meet the requirements of IEC 61439-1, see above. Check with local / state / country electrical codes for allowance.
	Symmetrical shielded cable with three phase conductors and a concentric PE conductor as shield. A separate PE conductor is required if the shield does not meet the requirements of IEC 61439-1, see above.
	Symmetrical shielded cable with three phase conductors and symmetrically constructed PE conductor, and a shield. The PE conductor must meet the requirements of IEC 61439-1.

Not allowed power cable types

	Symmetrical shielded cable with individual shields for each phase conductor is not allowed on any cable size for input and motor cabling.

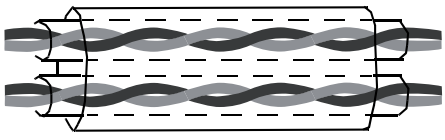
Selecting the control cables

General rules

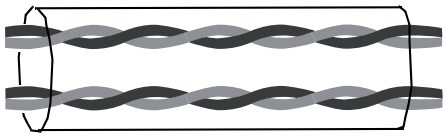
All control cables must be shielded.

Use a double-shielded twisted pair cable for analog signals. Employ one individually shielded pair for each signal. Do not use common return for different analog signals.

A double-shielded cable is the best alternative for low-voltage digital signals but single-shielded twisted pair cable (Figure b) is also usable.



a
A double-shielded twisted pair cable



b
A single-shielded twisted pair cable

Signals in separate cables

Run analog and digital signals in separate, shielded cables.

Never mix 24 V DC and 115/230 V AC signals in the same cable.

Signals allowed to be run in the same cable

Relay-controlled signals, providing their voltage does not exceed 48 V, can be run in the same cables as digital input signals. It is recommended that the relay-controlled signals be run as twisted pairs.

Relay cable type

The cable type with braided metallic screen (eg, ÖLFLEX by LAPPKABEL, Germany) has been tested and approved by ABB.

Routing the cables

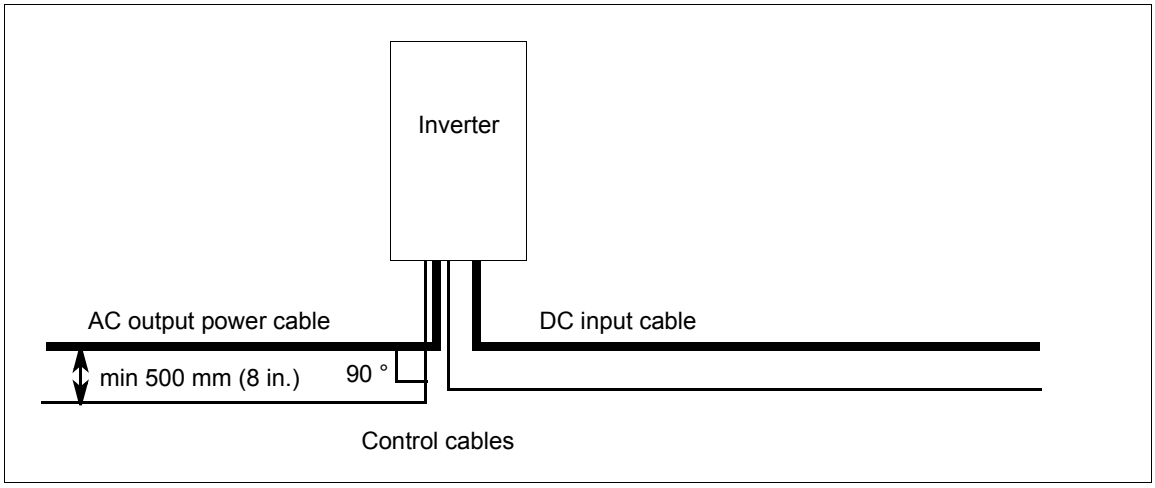
It is recommended that the input DC power cable, output AC power cable and control cables be installed on separate trays.

Where control cables must cross power cables ensure they are arranged at an angle as near to 90 degrees as possible. Do not run extra cables through the inverter.

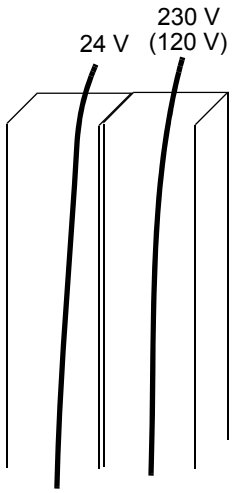
The cable trays must have good electrical bonding to each other and to the grounding electrodes. Aluminium tray systems can be used to improve local equalizing of potential.

If four conductor AC cabling is used, place the three output phase cables symmetrically and close to each other. Asymmmetrical installation may induce current to grounding cables and metal structures.

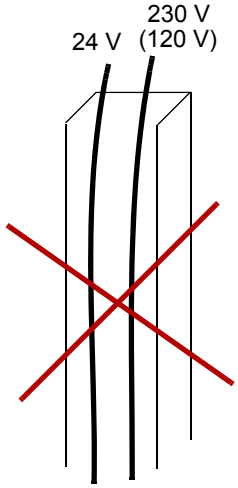
A diagram of the cable routing is shown below.



Separate control cable ducts



Lead 24 V and 230 V (120 V) control cables in separate ducts inside the cabinet.



Not allowed unless the 24 V cable is insulated for 230 V (120 V) or insulated with an insulation sleeving for 230 V (120 V).

Implementing short-circuit and thermal overload protection

Protecting the inverter and AC output cable in short-circuit situations

The inverter is equipped with internal AC fuses which restrict inverter damage in case of a short-circuit inside the inverter. Install external protection (such as fuses) according to local regulations, appropriate AC line voltage and the rated current of the inverter to protect the AC output cable.

Protecting the photovoltaic generator and DC input cable in short-circuit situations

The input DC fuses or optional DC input miniature circuit breakers (option +H377) protect the inverter DC circuit and the DC input cables in a short-circuit situation when the cable is dimensioned according to inverter nominal DC current and fuse and breaker ratings. See section *Fuses* on page *101* for the fuse and breaker ratings.

To protect inverters delivered without input DC fuses (option +0F291), follow the instructions in section *Instructions for inverters delivered without input DC fuses (option +0F291)* on page *62*.

Note: The inverter does not protect the photovoltaic generator. Install adequate protection devices to, for example, each string.

Protecting the inverter and the AC output cable against thermal overload

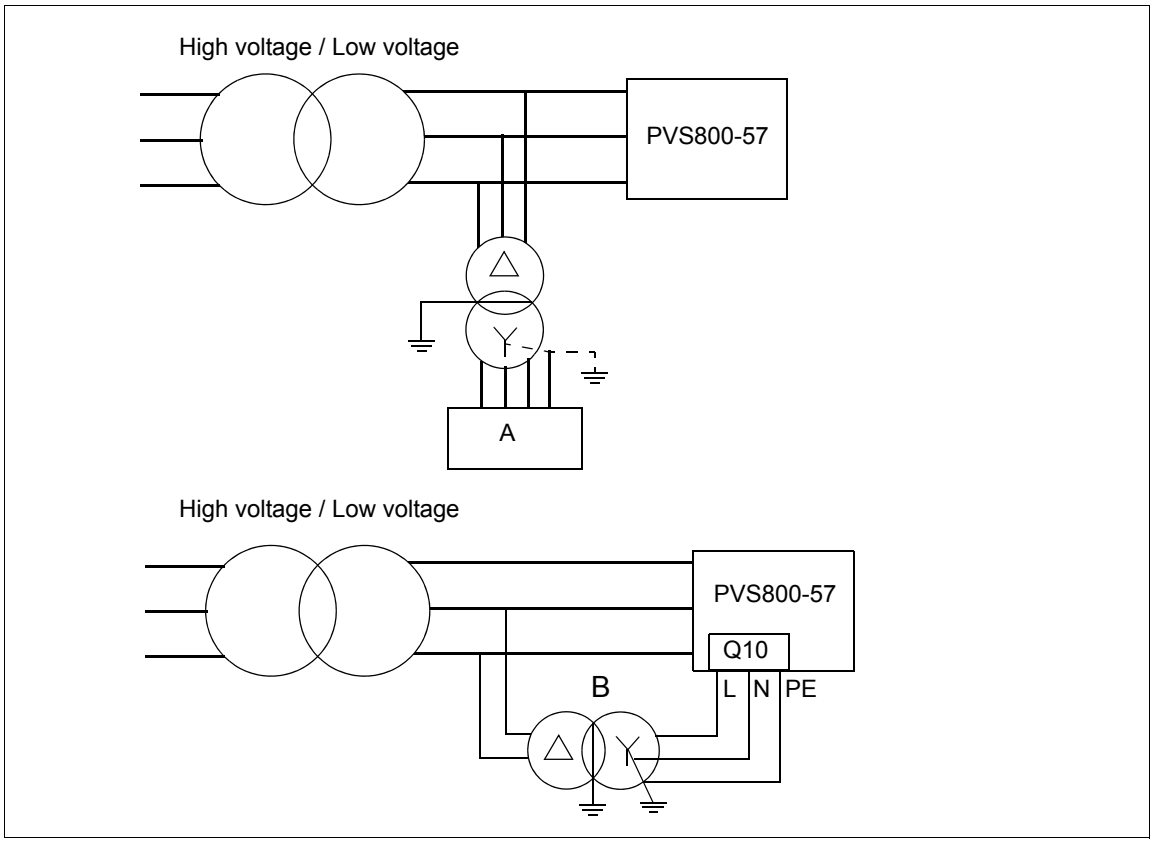
The inverter protects itself and the AC output cable against thermal overload when the cable is dimensioned according to the nominal current of the inverter. No additional thermal protection devices are needed.

Supplying power for the auxiliary circuits

Supply the inverter with rated auxiliary voltage. Protect the supply according to local regulations with, eg, fuses and/or fault current breakers. Do not connect any additional appliances to the inverter without consulting with ABB.

Supplying circuits from the AC output of the inverter

If the AC output of the inverter is used for supplying any circuits, provide galvanic isolation as shown in the diagram below. A denotes other equipment and B supplying auxiliary circuit of the inverter. See also *Connecting the external power supply cable for the auxiliary circuit* on page *69*. For instructions on selecting the transformer, see section *Selecting the transformer* on page *53*.



Implementing ground fault monitoring in IT (ungrounded) systems

The internal current sum measurement-based ground fault monitoring of the inverter detects ground faults in some cases in IT (ungrounded) systems. However, often the ground fault leakage current does not exceed the trip level and the inverter remains is operation. The inverter can be equipped with insulation monitoring device option +Q954, or the IT system must be monitored otherwise with a monitoring device suitable for use with inverters. Because of the leakage currents of inverters, many ground fault monitoring devices do not work properly with them.

Insulation monitoring device (option +Q954)

The option includes an insulation monitoring device with coupling device which enables monitoring the insulation resistance before the inverter is started.

The insulation monitoring device measures insulation resistance between the DC busbars and protective earth (PE). When the inverter modulates, the insulation monitoring device measures also instantaneously the AC line resistance against ground.

The device reacts to all ground faults in IT systems which are galvanically connected to each other. The ground fault detection is not based on system imbalance but the device detects symmetrical and unsymmetrical ground faults as well.

If the insulation resistance between the conductors and the ground falls below set response values, the insulation monitoring device alarm relay is switched and the indication LED lights up. The inverter is tripped or an alarm is given depending on the parameter settings.

When auxiliary power to the insulation monitoring device is switched off, its alarm relays are switched to the fault position.

The response values and parameters of the insulation monitoring device are set with its function keys.

Note: The insulation monitoring device measures the insulation resistance of the solar generator correctly according to the settings when the inverter is not operating. During operation the inverter may disturb the measuring. For disabling the monitoring device during the inverter operation, contact ABB.

Operation principle of the measuring circuit

The insulation monitoring device superimposes a pulsating measuring voltage on the system. The measuring pulse consists of positive and negative pulses of the same amplitude. The period depends on the respective leakage capacitances and the insulation resistance of the system to be monitored.

The monitoring device can be adapted to different photovoltaic module types with parameter settings. See the user's manual of the device.

Safety information

The insulation monitoring device is constructed according to state-of-the-art and recognized technical safety rules. Nevertheless, when the device is used, hazards may occur to the life and limb of the user or of third parties, or there may be adverse effects on the monitoring device or on other valuable property. The monitoring device must only be used

- for the purpose for which it is intended
- when it is in perfect technical condition as far as safety is concerned.

Only one insulation monitoring device may be used in each interconnected IT system.

When insulation or voltage test is to be carried out, the device is to be isolated from the system for the test period.

The ground fault monitoring function (+Q954) is not a personnel safety or fire protection feature.

Customer wiring

The insulation monitoring device can be connected to external systems. See the circuit diagrams delivered with the inverter.

Start-up

See chapter *Start-up*.

More information

- Circuit diagrams delivered with the inverter
- Manufacturer’s operating manual of the insulation monitoring device

Implementing positive or negative pole grounding (options +F282 and +F283)

Some solar module types require positive or negative grounding. Make sure that the optional positive (+F282) or negative (+F283) grounding method is suitable for the solar modules that you are using.

Ground the panels during long maintenance breaks if the panel type requires it.

Limiting the conducted disturbances with the EMC filter (option +E216) in low-voltage TN (grounded) networks

The optional EMC filter (+E216) can be installed at the network-side of the low voltage transformer to limit the conducted disturbances to other equipment connected to the network. The filter has capacitors connected to ground and is not suitable for IT (ungrounded) networks. Ensure that the network owner and operator allows the installation of this kind of a filter. The filter must always be installed according to local regulations.

Instructions for inverters delivered without input DC fuses (option +0F291)

If the standard input DC fuses are not suitable for the customer application, the inverter can be delivered without input DC fuses (option +0F291). In this case, install appropriate DC fuses to protect the inverter DC circuit and the DC input cables in a short-circuit situation. Protect the positive and negative poles of an input with separate fuses. The power loss of a fuse may never exceed 25 W.

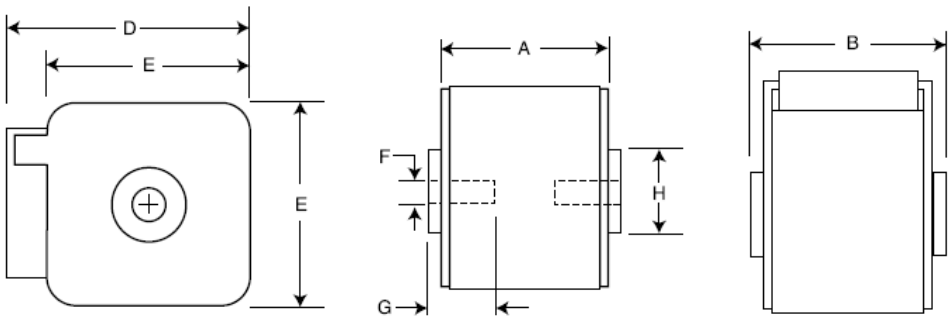
The table below shows the rated DC current for selecting the input DC fuses (see the next table) as per the number of the DC input connections to the solar generator.

No. of DC input connections	Rated current for the input DC fuses (A)			
	-0250kW-A	-0315kW-B	-0500kW-A	-0630kW-B
2	400 A	500 A	-	-
3	315 A	315 A	-	-
4	250 A	250 A	400 A	500 A
5	250 A	250 A	350 A	400 A
6	160 A	160 A	315 A	315 A
7	160 A	160 A	250 A	250 A
8	160 A	160 A	250 A	250 A
9	-	-	250 A	250 A
10	-	-	160 A	160 A
11	-	-	160 A	160 A
12	-	-	160 A	160 A

The table below shows the recommended input DC fuse types. Smaller fuses can also be used.

Rated DC fuse current of the inverter (A)	Recommended input DC fuses	
	Bussmann	Mersen
500 A	170M4395	PC71UD11C500TF
400 A	170M4393	PC71UD13C400TF
350 A	170M4392	PC71UD13C350TF
315 A	170M4391	PC71UD13C315TF
250 A	170M4390	PC71UD13C250TF
160 A	170M4388	PC71UD13C160TF

Dimensions of the recommended fuses (mm). 1 mm = 0.0394 in.



Size	Type	Type code	A	B	D	E	F	G	H
1	BKN / 75	170M43**	74	75	69	53	M8	5	20

Mechanical installation of the input DC fuses

Use M8 bolts and nuts to connect the fuses to the busbars.

6

Electrical installation

What this chapter contains

This chapter describes the electrical installation process of the inverter.

Warnings

WARNING! Only qualified electricians are allowed to carry out the work described in this chapter. Follow the *Safety instructions* on the first pages of this manual. Ignoring the safety instructions can cause injury or death.

Checking the insulation of the assembly

Inverter

Every inverter module has been tested for insulation between the main circuit and the chassis (2700 V rms 50 Hz for 1 second) at the factory. Therefore, do not make any voltage tolerance or insulation resistance tests eg, hi-pot or megger, on any part of the inverter.

AC output cable

Check the insulation of the AC output cable according to local regulations before connecting it to the inverter.

DC input cable(s)

Check the insulation of the DC input cable(s) according to local regulations before connecting it to the inverter.

Photovoltaic generator

Ensure that the insulation of the solar generator has been checked according to manufacturer's instructions. The solar generator must be disconnected from the inverter during the insulation check.

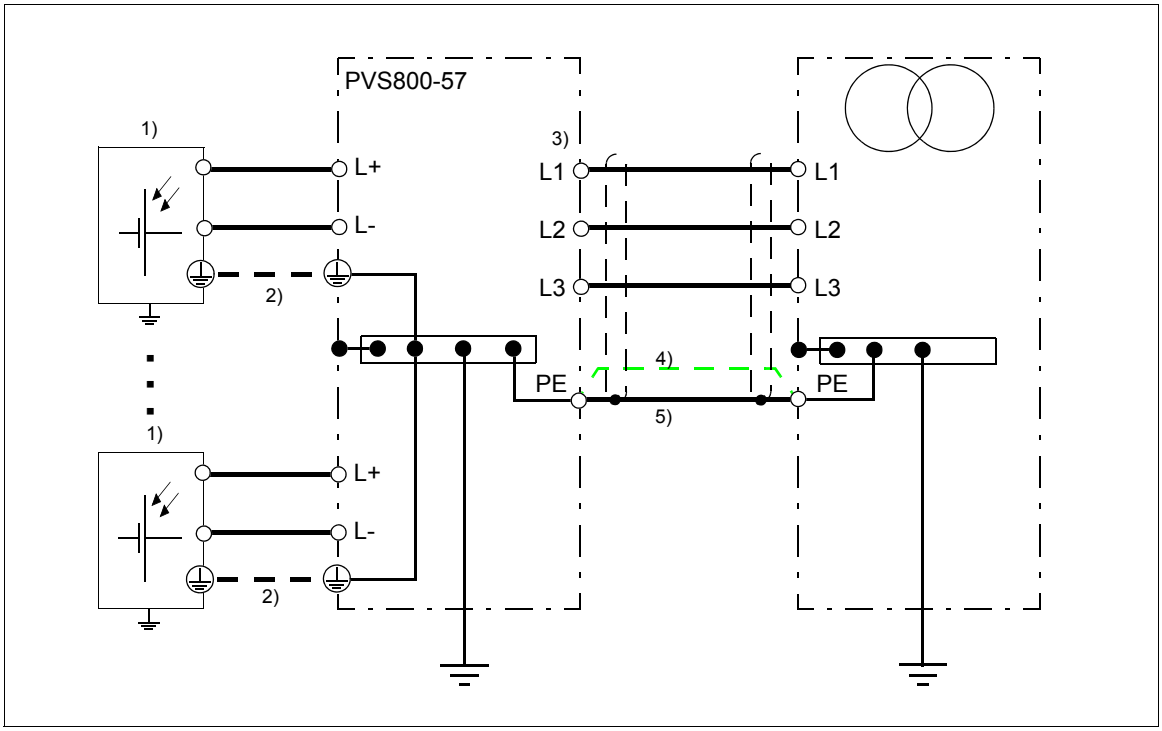
Checking the compatibility with IT (ungrounded) systems

The EMC filter (option +E216) is not suitable for use in an IT (ungrounded) system. Check that the low-voltage network is of the TN (grounded) type. If not, please contact ABB.

WARNING! If the optional EMC filter +E216 is installed on an IT system (an ungrounded power system or a high resistance-grounded [over 30 ohm] power system, the system will be connected to earth potential through the EMC filter capacitors. This may cause danger or damage the equipment in the network.

Connecting the power cables

Connection diagram



1) Solar array junction box

2) One DC line needs to be grounded for certain thin-film photovoltaic module types and if required by country-specific regulations.

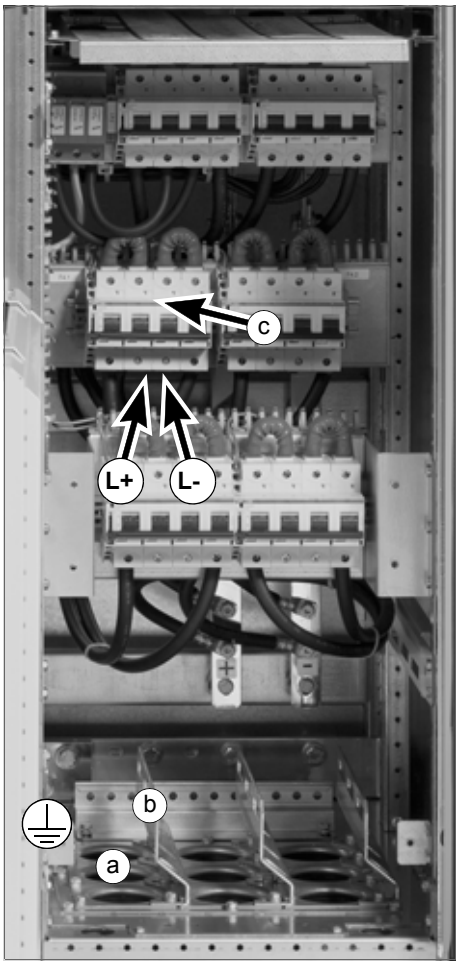
3) 360 degrees grounding is recommended at the cabinet entry if shielded cable is used. Ground the other end of the input cable shield or PE conductor at the transformer.

4), 5) If shielded cable is used (not required but recommended) and the conductivity of the shield is < 50% of the conductivity of the phase conductor, use a separate PE cable (5) or a cable with a grounding conductor (4).

DC input cable connection procedure

1. Remove the shroud covering the input power terminals.
2. Lead the cable(s) into the inside of the cabinet. If shielded cable is used, connect the shield to the cabinet grounding busbar with a cable lug.
3. Connect the DC- conductor to terminal L- and the DC+ conductor to terminal L+.

   Note: In the R8i and 2 × R8i frame sizes with fuse-protected DC input connections, the location of the + and - terminals varies depending on the number of the DC input connections. See chapter *Dimension drawings*.
4. If a separate PE conductor is used, connect it to the cabinet grounding terminal.
5. Refit the shroud onto the input power terminals.

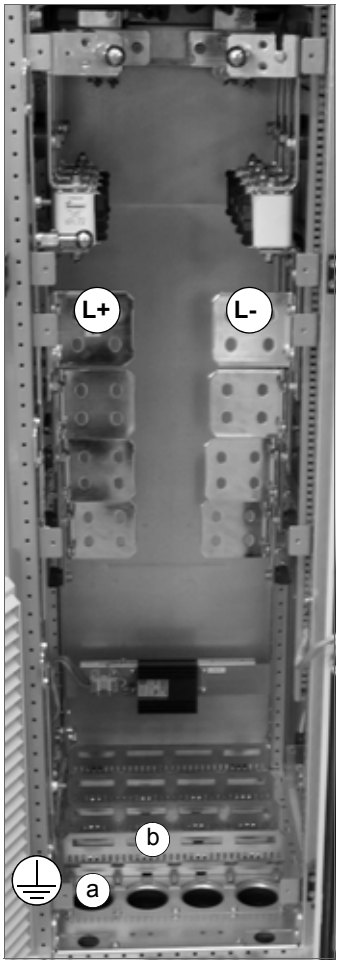


DC input terminals of frame R7i with option +H377 (four miniature circuit breakers for two DC input connections)

a) Cable lead-throughs

b) Cable support

b) DC input miniature circuit breakers



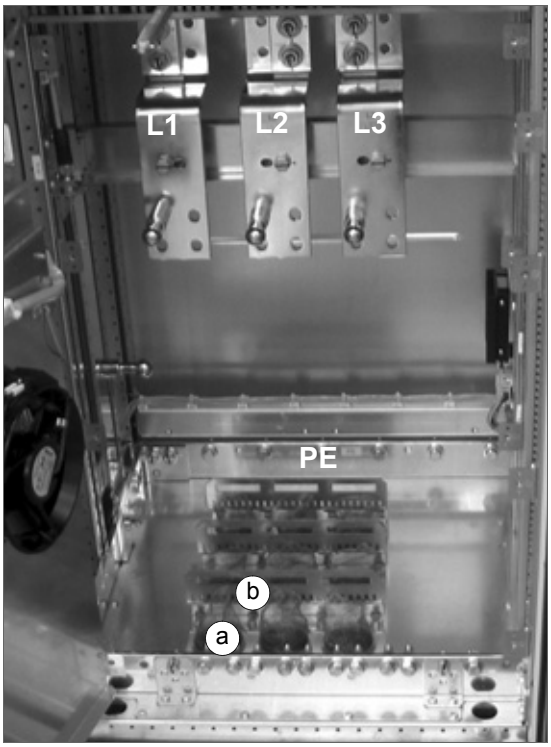
DC input terminals of frame R8i with option +4H382 and frame 2 × R8i (four fuse-protected DC input connections)

a) Cable lead-throughs

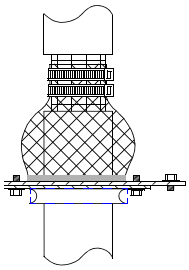
b) Cable support

AC output cable connection procedure

1. Frames R7i and R8i: Remove the shroud covering the output power terminals. Frame 2 × R8i: Undo the three fastening screws of the cabinet fan swing-out frame covering the output power terminals and open the swing-out frame.
2. Lead the cable(s) into the inside of the cabinet. If shielded cable is used, make the 360° grounding arrangements at the cabinet entry as shown below, and connect the twisted shield of the AC output cable(s) to the cabinet PE (ground) busbar with a cable lug.
3. Connect the phase conductors to terminals L1, L2 and L3. Connect the separate PE/ grounding conductor (if present) to the cabinet PE (ground) busbar.
4. Refit the shroud onto the output power terminals.



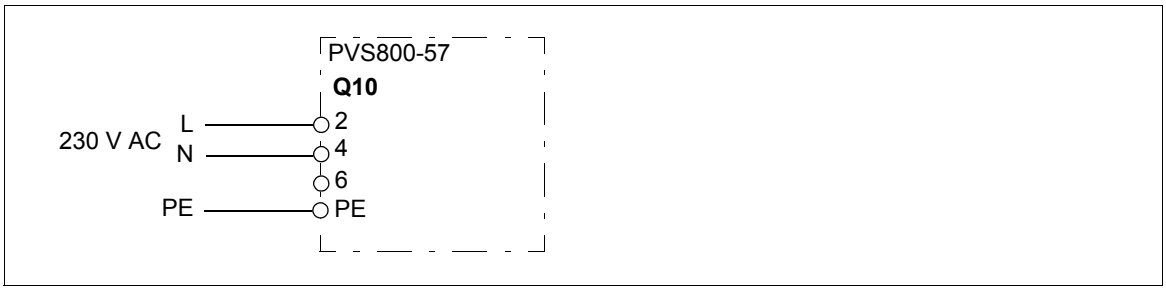
AC output terminals of PVS800-57-0630kW
a) 360 degrees EMC lead-throughs
b) Cable support



360 degrees grounding

Connecting the external power supply cable for the auxiliary circuit

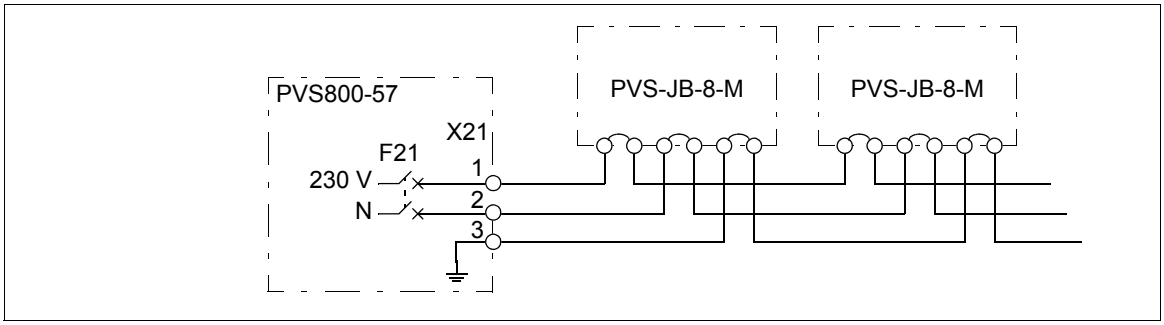
Connect the external power supply cable conductors to the terminals of auxiliary control voltage switch Q10 as shown below. For the location of the switch inside the cabinet, see the cabinet layout photos in chapter *Operation principle and hardware description*.



Maximum fuse: 16 A

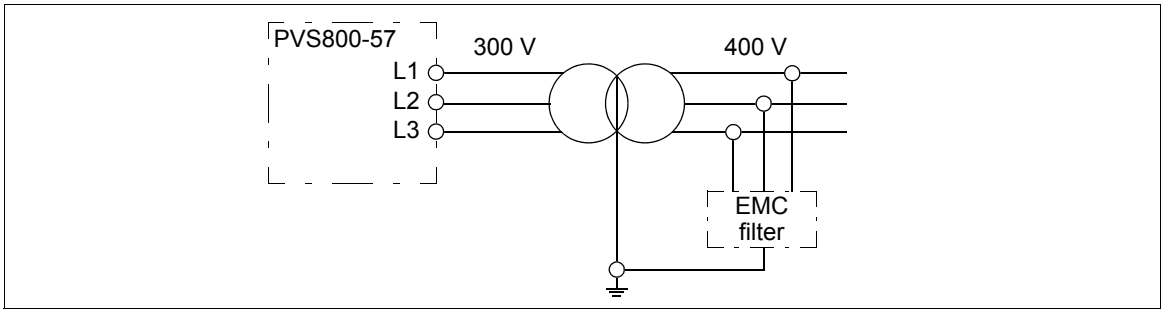
Note concerning power supply from IT (ungrounded) systems: Contact ABB for instructions. Equip the power supply for the auxiliary circuit with fault current circuit breakers for ground fault indication and tripping. If the overvoltage protection device of the auxiliary control voltage input causes unnecessary ground fault trippings, the type of the device must be changed.

Connecting the junction box power supply (option +G410)



Connecting the EMC filter (option +E216)

Connect the EMC filter on the network side of the low voltage transformer.



Connecting the control cables

External control cable connections to the RMIO board terminals of the inverter are shown below. For more information, see the firmware manual.

Default I/O connection diagram (RDCU – A43)

The external control cable connections to the RMIO board for the PVS800 solar inverter master control program with default settings are shown below (program version GSXR7340 and later).

Terminal block size:
cables 0.3 to 3.3 mm^2 (22 to 12 AWG)
Tightening torque:
0.2 to 0.4 N·m
(0.2 to 0.3 lbf·ft)

RMIO

X20

1	VREF-	Reference voltage -10 V DC, 1 kohm ≤ R_L ≤ 10 kohm
2	AGND	

X21

1	VREF+	Reference voltage 10 V DC, 1 kohm ≤ R_L ≤ 10 kohm
2	AGND	
3	AI1+	DC current measurement
4	AI1-	
5	AI2+	Grounding current measurement. 4…20 mA, R_{in} = 100 ohm [4]
6	AI2-	
7	AI3+	Solar generator DC voltage measurement. 0(4)…20 mA, R_{in} = 100 ohm
8	AI3-	
9	AO1+	By default, not in use. 0(4)…20 mA, R_L ≤ 700 ohm
10	AO1-	
11	AO2+	By default, not in use. 0(4)…20 mA, R_L ≤ 700 ohm
12	AO2-	

X22

1	DI1	Reset
2	DI2	By default, not in use. [1]
3	DI3	AC and DC overvoltage protection
4	DI4	DC cable overcurrent protection
5	DI5	Transformer trip (MWS)
6	DI6	Emergency stop (option +Q951)
7	+24VD	+24 V DC max. 100 mA
8	+24VD	
9	DGND1	Digital ground
10	DGND2	Digital ground
11	DIIL	DC grounding acknowledgement [4]

X23

1	+24V	Auxiliary voltage output and input, non-isolated, 24 V DC 250 mA [2]
2	GND	

X25

1	RO1	Relay output 1: By default, not in use. With option +Q951 reserved. [3]
2	RO1	
3	RO1	

X26

1	RO2	Relay output 2: Fault (-1)
2	RO2	
3	RO2	

X27

1	RO3	Relay output 3: Grounding switch control [4]
2	RO3	
3	RO3	

1) Can be configured for Start/Stop or other use with parameter settings.
2) Total maximum current shared between this output and the optional modules installed on the board.
3) Can be configured with parameter settings for resetting the emergency stop circuit with the emergency stop reset button on the cabinet door (option +Q951).
4) Used only with options +F282 and +F283.

Default I/O connection diagram (RDCU – A41)

The external control cable connections to the RMIO board for the PVS800 solar inverter control program with default settings are shown below (program version ISXR7340 and later).

Terminal block size:
cables 0.3 to 3.3 mm^2 (22 to 12 AWG)
Tightening torque:
0.2 to 0.4 N·m
(0.2 to 0.3 lbf·ft)

RMIO

X20

1	VREF-	By default, not in use. -10 V DC, 1 kohm ≤ R_L ≤ 10 kohm
2	AGND	

X21

1	VREF+	By default, not in use. 10 V DC, 1 kohm ≤ R_L ≤ 10 kohm
2	AGND	
3	AI1+	By default, not in use. -10 V … 10 V, R_{in} = 200 kohm
4	AI1-	
5	AI2+	Output/inverter (R7i) cubicle temperature measurement 4...20 mA ≙ -30…+80 °C.
6	AI2-	
7	AI3+	Incoming cubicle temperature measurement. 4...20 mA ≙ -30…+80 °C.
8	AI3-	
9	AO1+	By default, not in use. 0(4)…20 mA, R_L ≤ 700 ohm
10	AO1-	
11	AO2+	By default, not in use. 0(4)…20 mA, R_L ≤ 700 ohm
12	AO2-	

X22

1	DI1	Fan acknowledgement and LCL filter temperature supervision
2	DI2	Inverter start/stop
3	DI3	AC contactor K1/K1.1 supervision
4	DI4	Ground fault supervision (option +Q954)
5	DI5	By default, not in use.
6	DI6	By default, not in use.
7	+24VD	+24 V DC max. 100 mA
8	+24VD	
9	DGND1	Digital ground
10	DGND2	Digital ground
11	DIIL	By default, not in use.

X23

1	+24V	Auxiliary voltage output and input, non-isolated, 24 V DC 250 mA [1]
2	GND	

X25

1	RO1	Relay output 1: Charging contactor K19 or K19.1 control
2	RO1	
3	RO1	

X26

1	RO2	Relay output 2: Ground fault reset with option +Q954
2	RO2	
3	RO2	

X27

1	RO3	Relay output 3: Main AC contactor control
2	RO3	
3	RO3	

1) Total maximum current shared between this output and the optional modules installed on the board.

Default I/O connections (RDIO on RDCU – A41)

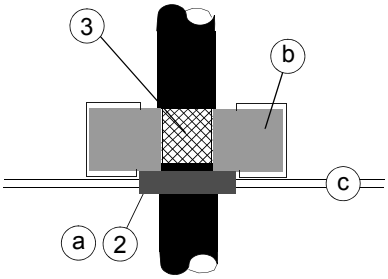
The default connections of the RDIO-01 Digital I/O Extension Modules inserted on the inverter control unit are shown below.

Digital input/output	RDIO terminal	Description	
		100 kW, 250 kW units	500 kW units
RDIO-01 no. 1 on Slot 2 – A412			
Digital input 1	X11:DI1	DC contactor K2 status (1 = closed)	DC contactor K2.1 status (1 = closed)
Digital input 2	X12:DI2	-	DC contactor K2.2 status (1 = closed)
Digital input 3	X12:DI3	Grid monitoring relay status (0 = tripped)	Grid monitoring relay status (0 = tripped)
Digital output 1	X21:R1	DC contactor K2 close command	DC contactor K2.1 close command
Digital output 2	X22:R2	-	DC contactor K2.2 close command
RDIO-01 no. 2 on Slot 1 – A411			
Digital input 4	X11:DI1	-	AC contactor K1.2 supervision
Digital input 5	X12:DI2	-	-
Digital input 6	X12:DI3	-	-
Digital output 3	X21:R1	-	AC contactor K1.2 close command
Digital output 4	X22:R2	-	Charging contactor K19.2 close command

Connection procedure

Making 360 degrees grounding at the cabinet lead-through for the control cables

1. Loosen the EMI conductive cushions.
2. Cut adequate holes to the rubber grommets in the lead-through plate and lead the cables through the grommets and the cushions into the cabinet.
3. Strip off the cable plastic sheath above the lead-through plate just enough to ensure proper connection of the bare shield and the EMI conductive cushions.
4. Tighten the EMI conductive cushions around the bare shield.

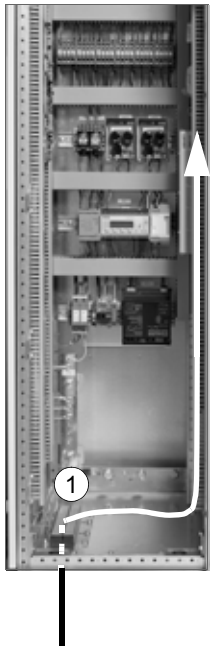


Side view of the cable lead-through

a) Grommet

b) EMI conductive cushion

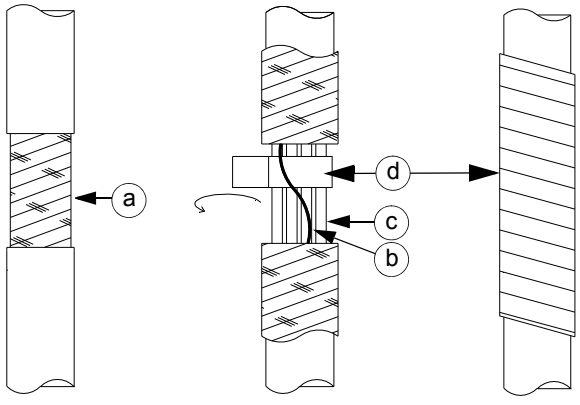
c) Lead-through plate



Control cable routing (Auxiliary control cubicle of PVS800-57-0500kW)

Note: If the outer surface of the shield is non-conductive:

- Cut the shield at the midpoint of the bare part. Be careful not to cut the conductors or the grounding wire (if present).
- Turn the shield inside out to expose its conductive surface.
- Cover the turned shield and the stripped cable with copper foil to keep the shielding continuous.



a) Cable shield

b) Grounding wire

c) Shielded twisted pair

d) Copper foil

Connecting the cables to the I/O terminals

Connect the conductors to the appropriate detachable terminals of the RMIO board (see pages *70* and *71*). At the terminal block, use shrink tubing or insulating tape to contain any stray strands. The shield (especially in case of multiple shields) can also be terminated with a lug and fastened with a screw at nearest grounding clamp. Leave the other end of the shield unconnected or ground it indirectly via a few nanofarads high-frequency capacitor, eg, 3.3 nF / 630 V. The shield can also be grounded directly at both ends if they are *in the same ground line* with no significant voltage drop between the end points.Tighten the screws to secure the connection.
Note: Keep any signal wire pairs twisted as close to the terminals as possible. Twisting the wire with its return wire reduces disturbances caused by inductive coupling.

Connecting a PC

For connecting a PC to the inverter during the start-up procedure, see chapter *Start-up*.

For normal use, connect the PC through a fiber optic link to CH3 of the RDCO module inserted in the master control unit (A43).

Installing optional modules

Mechanical installation

Optional modules such as fieldbus adapters and I/O extensions are inserted in the optional module slot on the RDCU Control Unit at the factory. The module is fastened with a screw. See page *37* for the available slots.

Note: Correct installation of the screw is essential for fulfilling the EMC requirements and for proper operation of the module.

Wiring the modules

See the appropriate optional module manual for specific installation and wiring instructions.

7

Installation checklist

What this chapter contains

This chapter contains a list for checking the mechanical and electrical installation of the inverter.

Checklist

Go through the checks below with another person. Follow the *Safety instructions* given on the first pages of this manual.

	Check that…
MECHANICAL INSTALLATION	
☐	There is sufficient free space around the unit. (See page *103*.)
☐	The ambient operating conditions are allowed. (See page *113*.)
☐	The unit is properly fastened to the floor and wall. (See *Mechanical installation*)
☐	The cooling air is able to flow freely.
ELECTRICAL INSTALLATION (See *Electrical installation*)	
☐	The capacitors are reformed if stored over one year (refer to *Capacitor reforming instructions* (3BFE64059629 [English]).
☐	The inverter is grounded properly.
☐	The AC line voltage matches the nominal output voltage of the inverter.
☐	The AC transformer is suitable for use with the inverter. (See section *Selecting the transformer*, page *53*.)

Check that…

- ☐ The insulation of the assembly is sufficient. (See *Checking the insulation of the assembly*, page *65*.)
- ☐ That the AC power system is an IT (ungrounded) system.
- ☐ The AC power cable connections at L1, L2 and L3 and their tightening torques are OK.
- ☐ The DC power cable connections at UDC+ and UDC– and their tightening torques are OK.
- ☐ The power cables are routed away from other cables. (See section *Routing the cables*, page *58*.)
- ☐ The auxiliary power supply cable connections at Q10 and their tightening torques are OK.
- ☐ The external control connections to the inverter are OK (including emergency stop, fieldbus etc.).
- ☐ The cable connections at the junction box (option +K479) and their tightening torques are OK.
- ☐ The EMC filter (option +E216) is correctly installed, if present.
- ☐ There are no tools, foreign objects or dust from drilling inside the modules or the cabinet.
- ☐ All shrouds and covers are in place.

8

Start-up

What this chapter contains

This chapter describes the start-up procedure of the inverter. It also gives some advice for operation.

Start-up procedure

The functioning of the inverter is first tested in the local control mode with the control panel (CDP312R). Thereafter, the control program parameters are set. The start-up procedure is described step-by-step in the table below.

SAFETY		
☐	**WARNING!** Follow the safety instructions during the installation and start-up procedure. See chapter *Safety instructions*.	
☐	Only qualified electricians are allowed to install and start-up the inverter.	
PRIMARY CHECKS		
☐	Check that the mechanical and electrical installation of the inverter is OK. See chapter *Installation checklist*.	
☐	Check that the insulation of the assembly is OK. See section *Checking the insulation of the assembly*, page *65*.	**Note:** If the insulation is not OK, the optional insulation resistance monitoring (+Q954) cannot be tuned properly.

☐	Check that it is light enough for the inverter to be able to feed power to the AC power system (grid) once it is operating.	**Note:** There must be enough light so that the solar generator is able to feed power to the inverter. This enables verifying that the inverter functions properly. Parameter settings can be done during the dark hours. Also, the inverter modulation can be tested without input power from the photovoltaic arrays.
☐	Check that the polarity and voltage of each connected DC solar string is correct: • Remove the inverter DC fuses. • Measure that the plus pole is connected to the plus terminal and the minus pole to the minus terminal and the voltage is correct. • Replace the DC fuses.	**Note**: There should be a record/ document stating that the polarity and voltage of each solar string is OK. The resistance value should be available for setting up the optional insulation monitoring device.
☐	Verify the expected DC voltage. Check that the open circuit DC voltage from the solar generator lies within the allowed range of the inverter (eg, 450…1000 V DC).	**Note**: The expected DC voltage can be estimated by using the open circuit voltage of the solar modules and the number of modules in a string.
FIRST START (local control mode)		
☐	Measure and record the DC voltage. Units with optional miniature circuit breakers (+H377): Open the miniature circuit breakers. Measure and record all DC inputs.	**Note**: The expected and measured DC voltages should be roughly equal.
☐	Units with optional miniature circuit breakers (+H377): Close the miniature circuit breakers.	

☐	Switch on the auxiliary power.	The control boards should “wake up”. The inverter is in the stand-by mode if no faults are active. Then, the control panel shows STAND BY. For descriptions of the inverter modes, refer to the firmware manual.
		`1 -> 654.0 V`
		`STATE STAND BY`
		`AC POWER 0.0 kW`
		`AC CURR1 0 A`
		Note: There may be fault and warning indications flashing on the display. They will be reset during the next steps.

☐	Ensure that the control panel is controlling the master control unit (A43) by checking the node number from the display.	See the firmware manual.
☐	Units with optional emergency stop function (+Q951): Release the emergency stop button and reset the emergency stop.	
☐	Units with optional positive/negative grounding (+F282/+F283): Configure the grounding option.	See the firmware manual.
☐	Reset all faults on both control boards.	
☐	If there are no faults or only the grid monitoring fault, close the AC main switch.	**Note**: The grid monitoring fault cannot be reset before the AC voltage is connected. Wait for the grid monitoring relay to reset before resetting the fault from the control panel.

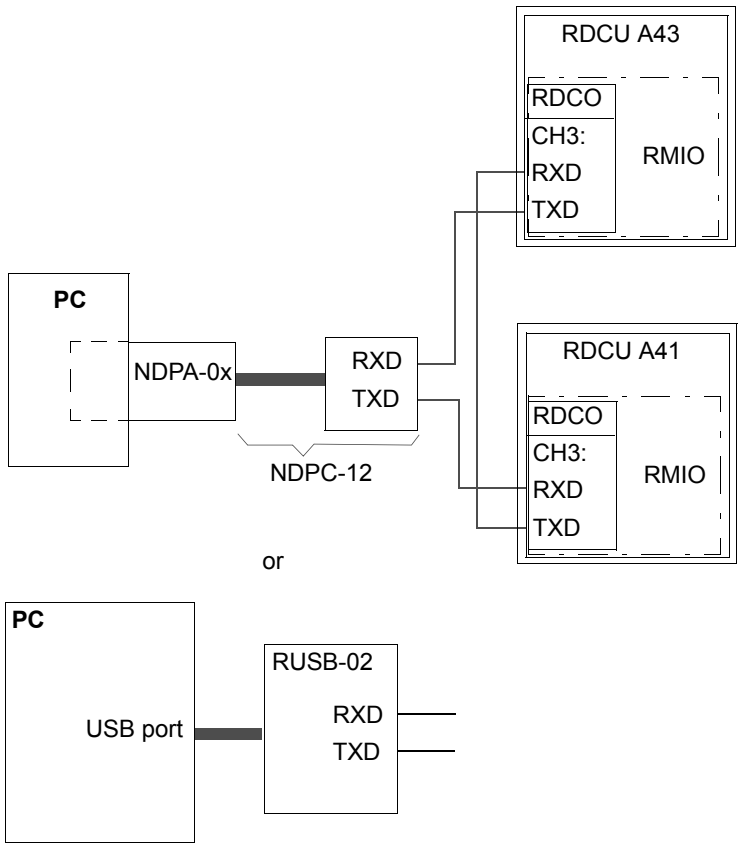
☐	The DC voltage should match the value of 01.34 PV MODULE DC MEAS in the Master control program.	**Note**: If the DC voltage differs from the parameter value, do not try to start the inverter. Contact ABB.
☐	Check that the inverter is in local control mode, ie, letter L is at the top row of the control panel display. If not, press the control panel key (LOC/REM).	1 L -> 654.0 V STATE STAND BY AC POWER 0.0 kW AC CURR1 0 A
☐	Start the inverter by pressing the control panel key (I). *Description of the events in a normal starting procedure* After reveiving the start command, the inverter goes to the SLEEP mode. 1 L -> 598.0 V I STATE SLEEP AC POWER 0.0 kW AC CURR1 0 A If there is enough DC voltage available, the inverter starts with the START ISU mode after a delay defined by parameter group 31. 1 L -> 617.0 V I STATE START ISU AC POWER 0.0 kW AC CURR1 0 A In this mode the inverter charges the DC capacitors from the AC output and synchronises to the grid. The DC contactor closes. The inverter goes to the MPPT mode and starts to produce power to the AC output. 1 L -> 570.0 V I STATE MPPT AC POWER 20.0 kW AC CURR1 39 A When there is not enough DC voltage and/or power available, the inverter goes back to the SLEEP mode after a delay defined by parameter group 31. It may be useful to shorten the delays during the start-up temporarily. Wake-up and sleep levels should match the available DC voltage.	
☐	Check that the inverter operates properly from the following actual value parameters 01.34 PV MODULE DC MEAS, 01.11 POWER (%) and 01.07 AC CURRENT L1. The DC voltage should have dropped from the earlier measured open circuit voltage and the power should match the current.	Example display: 1 L -> 500.0 V I STATE MPPT AC POWER 102.0 kW AC CURR1 197 A
☐	Stop the inverter by pressing the control panel key (O).	**Note**: Some grid-related functions like the low voltage ride-through and grid monitoring will start to work only after the inverter has been started and stopped once.

☐	Set parameter 98.08 AUTO LINE ID RUN to NO.	This parameter setting prevents an unneccessary ID run in case of auxiliary power loss of the control board. **Note:** If the phase order changes, set 99.07 LINE SIDE ID RUN to YES to run the ID run once. See the firmware manual.
SETTING THE INVERTER MASTER CONTROL PROGRAM PARAMETERS		
☐	Set the wake up and sleep levels in parameter group 31 and other start-up parameters.	Correct settings minimise the start-ups in the morning and shut-downs in the evening. It is useful to follow the operation for a few days and nights. It may be needed to adjust the settings according to the season. See *PVS800 central inverters firmware manual* (3AUA0000058422 [English])
☐	Set the remote or automatic reset and start functions.	**Note:** Ensure that local regulations and site-specific requirements allow the remote or automatic reset and start after faults.
SETTING UP FIELDBUS CONTROL (remote control mode)		
☐	Set the fieldbus parameters of the inverter control programs.	See *PVS800 central inverters firmware manual* (3AUA0000058422 [English]) and the appropriate fieldbus adapter module manual.
☐	Check that you can read the signals.	
☐	Check that you can start and stop the inverter.	
☐	Check that the inverter can be seen from the PLC.	
☐	Test control and actual values.	
SETTING UP THE INSULATION MONITORING DEVICE (option +Q954)		
☐	Check that there is only one insulation monitoring device for all inverters in the same galvanically connected IT system.	
☐	Adjust the settings of the insulation monitoring device to suit the installation.	More information: • Circuit diagrams delivered with the inverter • Insulation monitoring device manufacturer's operating manual
☐	In case the insulation monitoring device trips while the inverter is running but shows acceptable values before starting, disable the measuring during operation.	**Note**: Ensure that local regulations and site-specific requirements allow the disabling of the monitoring.
SETTING UP THE CABINET HEATER (option +G300)		
☐	Set the maximum temperature with the T65 thermostat (default 10 °C).	

☐	Choose the control mode by connecting the heater power supply wire to one of the three terminals listed below: • X5:3 = Heating is switched off by the T65 thermostat and when the inverter is modulating. • X5:4 = Heating is controlled by the K65 customer control relay 24 V DC control signal and by the T65 thermostat. • X5:5 = Heating is only controlled by the T65 thermostat.	The optional cabinet heater has three control modes (see circuit diagram sheets 64 and 65 delivered with the inverter). The control mode can be selected by changing the heater power supply wire in the auxiliary control cabinet. More information: Circuit diagrams delivered with the inverter

Connecting DriveWindow

If the DriveWindow PC tool is used in the start-up procedure, proceed as follows.

☐	Connect the PC to the inverter in a ring as shown below: 	
☐	Start the DriveWindow program and connect to the inverter by choosing ABB.SMP OPC server.	**Note:** If all connected control units are not seen through the optical ring, check that the node address of each RMIO board is set properly. Connect optical fibers to channel CH3 in each RMIO board and change parameter 70.15 CH3 NODE ADDR accordingly. **Note:** The new node address becomes valid only after the next power up of the RMIO board.
☐	Open the parameter window from the DriveWindow program.	

Configuring the NETA-01 Ethernet Adapter Module

See the *NETA-01 Ethernet Adapter Module User-s Manual* (3AFE64605062 [English])

9

Fault tracing

What this chapter contains

This chapter describes the fault tracing possibilities of the inverter.

LEDs

This table describes LEDs of the inverter.

Where	LED	When the LED is lit
RMIO board (A41)	Red	Inverter in fault state
	Green	The power supply on the board is OK.
RMIO board (A43)	Red	Inverter in fault state
	Green	The power supply on the board is OK.
Control panel mounting platform	Red	Inverter in fault state
	Green	The main + 24 V power supply for the control panel and the RMIO board is OK.
AINT board	V204 (green)	+5 V voltage of the board is OK.
	V309 (red)	Not in use.
	V310 (green)	IGBT control signal transmission to the gate driver control boards is enabled.

Warning and fault messages displayed by the CDP-312R Control Panel

The control panel displays the warnings and faults of the inverter control unit that it is currently controlling. Flashing messages WARNING, ID:2 or FAULT, ID:2 on the control panel display indicate a warning or fault at the other control unit. To display the warning or fault identification text, shift the control panel to view the other control unit.

See *PVS800 central inverters firmware manual* (3AUA0000058422 [English]) for the descriptions, causes and remedies of the warning and fault messages.

Fault: Same ID numbers

If the ID numbers of the two control units are set equal, the control panel stops functioning. To clear the situation:

- Disconnect the panel cable from the master control unit RMIO board (A43).
- Set the ID number of the inverter control unit RMIO board (A41) to 2. For the setting procedure, see the *PVS800 central inverters firmware manual* (3AUA0000058422 [English]).
- Connect the disconnected cable to the RMIO board of the master control unit (A43) again and set its ID number to 1.

Fault tracing of the insulation monitoring device (option +Q954)

Refer to section *Implementing ground fault monitoring in IT (ungrounded) systems*, page *60*.

10

Maintenance

What this chapter contains

This chapter contains preventive maintenance instructions of the inverter.

Maintenance intervals

If installed in an appropriate environment, the inverter requires very little maintenance. The table below lists the routine maintenance intervals recommended by ABB.

The recommended maintenance intervals and component replacements are based on specified operational and environmental conditions. ABB recommends annual inverter inspections to ensure the highest reliability and optimum performance. Consult your local ABB Service representative for more details on the maintenance. On the Internet, go to http://www.abb.com/drivesservices.

Maintenance	Interval	Instructions
Capacitor reforming	Every year when stored	See *Reforming the capacitors*.
Heatsink temperature check and cleaning	Depending on the dustiness of the environment, every 6 to 12 months	See *Cleaning the heatsink*.
Cabinet air filter replacement	Every year	See *Replacing the air filters.*
Frame R8i inverter modules: Check and cleaning of power connections	Every 3 years	See *Checking and cleaning the power connections (R8i, 2 × R8i)*.
LCL filter fan change	Every 6 years	See *Fans*.
Cabinet door fan change	Every 6 years	See *Fans*.
Cabinet roof fan change	Every 6 years	See *Fans*.

Inverter module fan change	Every 6 years	See *Fans*.
Capacitor change	Every 20 years	See *Capacitors*.

4FPS1000027105

Cleaning the interior of the cabinet

WARNING! Follow the safety instructions, page *11*. Ignoring the instructions can cause physical injury or death, or damage to the equipment.

WARNING! Use a vacuum cleaner with an antistatic hose and nozzle. Using a normal vacuum cleaner creates static discharges which can damage circuit boards.

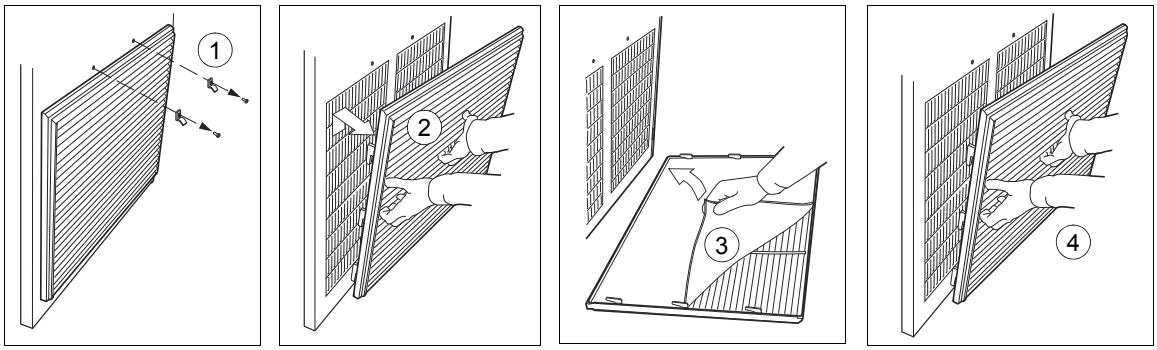
1. Repeat the seven steps safety precautions, page *12*. Stop the inverter and disconnect it from the AC and DC power lines. Wait for five minutes to let the inverter DC capacitors discharge before opening the cabinet door. Ensure by measuring with a multimeter (impedance at least 1 Mohm) that there is no voltage present.
2. When necessary, clean the interior of the cabinet with a soft brush and a vacuum cleaner.
3. Clean the air inlets and outlets of the fans.
4. Check the air inlet filters of the cabinet. Replace when necessary; see section *Replacing the air filters* below.

Replacing the air filters

Check the air filters and replace if necessary (see section *Losses, cooling data and noise* on page *103* for the correct filter types).

Inlet (door) filters

1. Remove the fasteners at the top of the grating.
2. Lift the grating and pull it away from the door.
3. Replace the air filter mat.
4. Install the grating in reverse order.



Cleaning the heatsink

The inverter module heatsink fins pick up dust from the cooling air. Check the cleanliness of the heatsink regularly. The inverter runs into overtemperature warnings and faults if the heatsink is not clean. When necessary, clean the heatsink as follows.

WARNING! Follow the safety instructions, page *11*. Ignoring the instructions can cause physical injury or death, or damage to the equipment.

1. Repeat the seven steps safety precautions, page *12*. Stop the inverter and disconnect it from the AC and DC power lines. Wait for five minutes to let the inverter DC capacitors discharge before opening the cabinet door. Ensure by measuring with a multimeter (impedance at least 1 Mohm) that there is no voltage present.
2. Open the inverter cubicle door.
3. Extract the inverter module from the cabinet as described in section *Replacing the inverter module (frames R8i, 2 × R8i)*.
4. Remove the module cooling fan as described in section *Fans* below.
5. Blow clean, dry compressed air (not humid) from bottom to top and simultaneously use a vacuum cleaner at the air outlet to trap the dust. **Note:** Prevent the dust from entering adjoining equipment.
6. Refit the cooling fan.

Checking and cleaning the power connections (R8i, 2 × R8i)

WARNING! Follow the safety instructions, page *11*. Ignoring the instructions can cause physical injury or death, or damage to the equipment.

1. Repeat the seven steps safety precautions, page *12*. Stop the inverter and disconnect it from the AC and DC power lines. Wait for five minutes to let the inverter DC capacitors discharge before opening the cabinet door. Ensure by measuring with a multimeter (impedance at least 1 Mohm) that there is no voltage present.
2. Open the inverter cubicle door.
3. Extract one inverter module from the cabinet as described in section *Replacing the inverter module (frames R8i, 2 × R8i)*.
4. Check the tightness of the cable connections at the quick connector. Use the tightening torque tables in chapter *Technical data*.
5. Clean all contact surfaces of the quick connector and apply a layer of suitable joint compound (eg, Isoflex® Topas NB 52 from Klüber Lubrication) onto them.
6. Re-insert the inverter module.
7. Repeat steps 4 to 7 for all remaining R8i inverter modules.

Fans

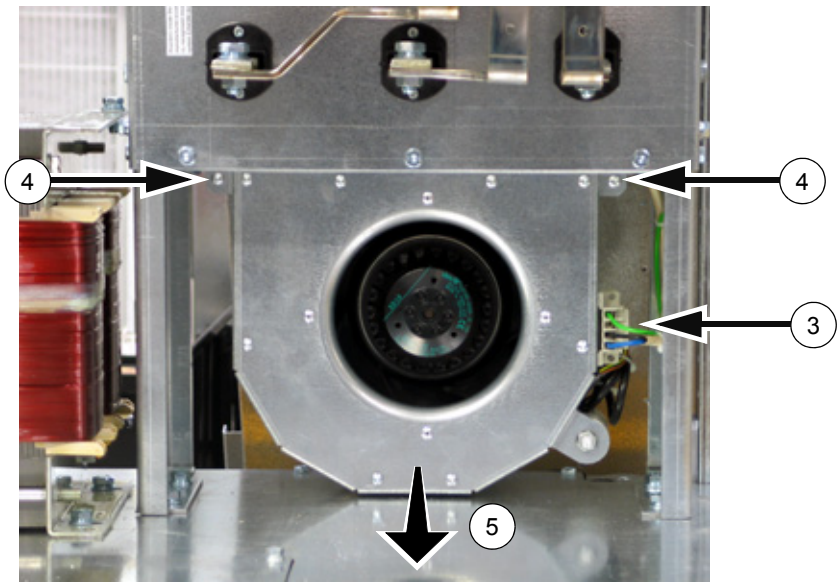
The cooling fan lifespan depends on the inverter usage and ambient temperature. See the firmware manual for an actual signal which indicates the hours of usage of the fan.

Fan failure can be predicted by the increasing noise from fan bearings and the gradual rise in the heatsink temperature in spite of heatsink cleaning. If the inverter is operated in a critical part of a process, fan replacement is recommended once these symptoms start appearing. Replacement fans are available from ABB. Do not use other than ABB-specified spare parts.

Replacing the LCL filter cooling fan (R7i)

WARNING! Follow the safety instructions, page *11*. Ignoring the instructions can cause physical injury or death, or damage to the equipment.

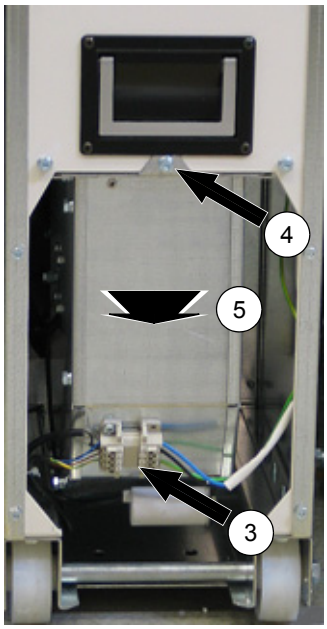
1. Repeat the seven steps safety precautions, page *12*. Stop the inverter and disconnect it from the AC and DC power lines. Wait for five minutes to let the inverter DC capacitors discharge before opening the cabinet door. Ensure by measuring with a multimeter (impedance at least 1 Mohm) that there is no voltage present.
2. Open the LCL filter cubicle door.
3. Disconnect the wire plug.
4. Remove the two screws holding the fan unit.
5. Pull the fan unit out.
6. Install new fan in reverse order.



Replacing the LCL filter cooling fan (R8i, 2 × R8i)

WARNING! Follow the safety instructions, page *11*. Ignoring the instructions can cause physical injury or death, or damage to the equipment.

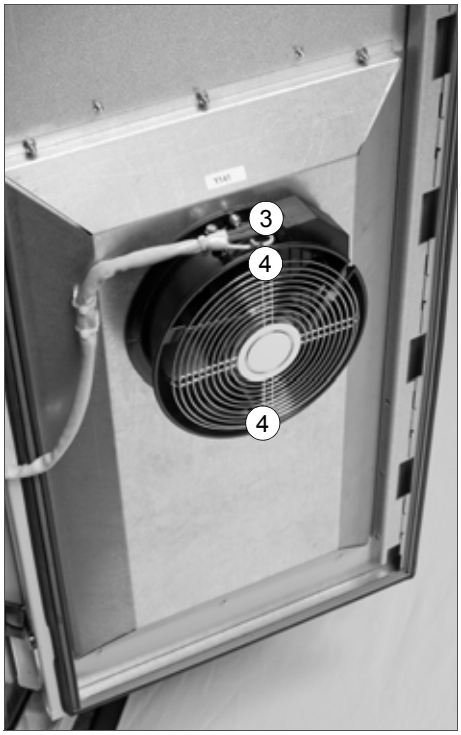
1. Repeat the seven steps safety precautions, page *12*. Stop the inverter and disconnect it from the AC and DC power lines. Wait for five minutes to let the inverter DC capacitors discharge before opening the cabinet door. Ensure by measuring with a multimeter (impedance at least 1 Mohm) that there is no voltage present.
2. Open the LCL filter cubicle door.
3. Disconnect the fan wiring plug.
4. Undo the screw of the fan fastening clip.
5. Pull the fan out.
6. Install a new fan in reverse order.



Replacing the incoming cubicle door fans (frames R8i and 2 × R8i and the output cubicle door fan (frame R8i)

WARNING! Follow the safety instructions, page *11*. Ignoring the instructions can cause physical injury or death, or damage to the equipment.

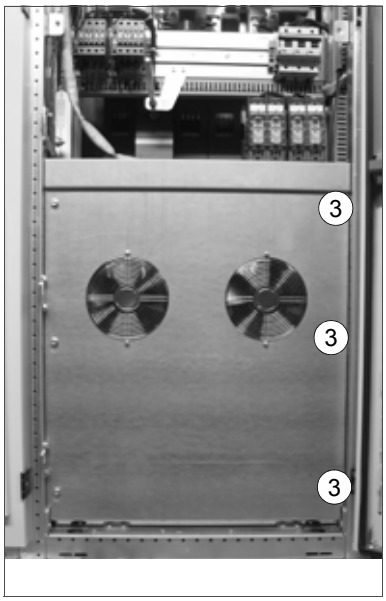
1. Repeat the seven steps safety precautions, page *12*. Stop the inverter and disconnect it from the AC and DC power lines. Wait for five minutes to let the inverter DC capacitors discharge before opening the cabinet door. Ensure by measuring with a multimeter (impedance at least 1 Mohm) that there is no voltage present.
2. Open the cubicle door.
3. Disconnect the fan supply wires.
4. Undo the fan fastening screws.
5. Install a new fan in reverse order.

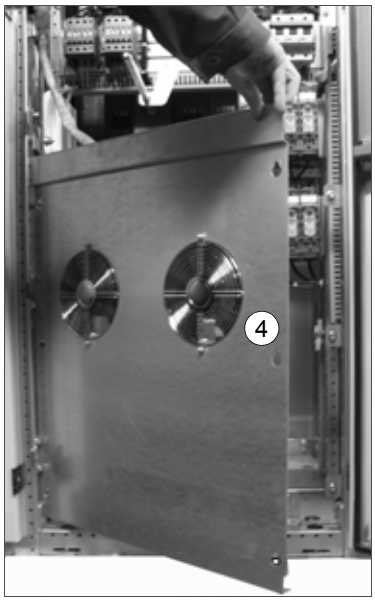


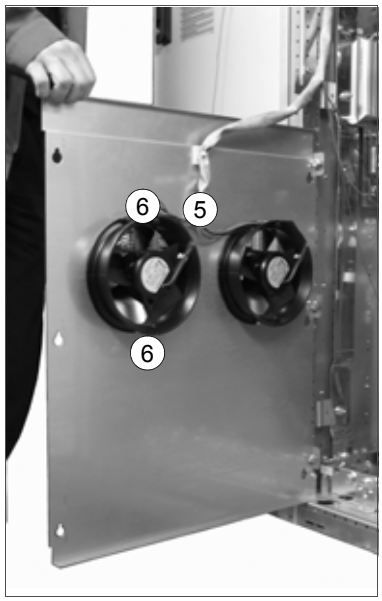
Replacing the output cubicle swing-out frame fans (frame 2 × R8i)

WARNING! Follow the safety instructions, page *11*. Ignoring the instructions can cause physical injury or death, or damage to the equipment.

1. Repeat the seven steps safety precautions, page *12*. Stop the inverter and disconnect it from the AC and DC power lines. Wait for five minutes to let the inverter DC capacitors discharge before opening the cabinet door. Ensure by measuring with a multimeter (impedance at least 1 Mohm) that there is no voltage present.
2. Open the output cubicle door.
3. Undo the three fastening screws of the cubicle fan swing-out frame.
4. Open the swing-out frame.
5. Disconnect the fan wiring plug.
6. Undo the fan fastening screws.
7. Install a new fan in reverse order.



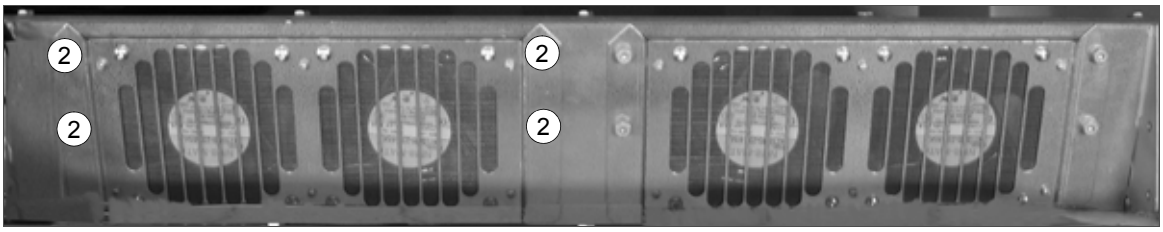


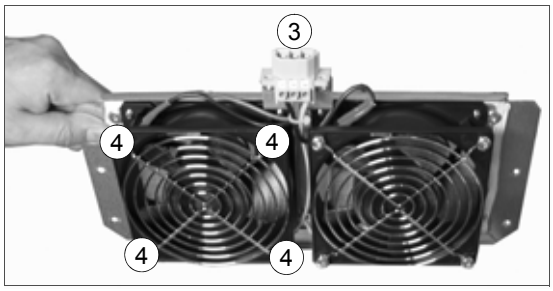


Replacing the cabinet roof fans (frames R8i and 2 × R8i with option +H377)

WARNING! Follow the safety instructions, page *11*. Ignoring the instructions can cause physical injury or death, or damage to the equipment.

1. Repeat the seven steps safety precautions, page *12*. Stop the inverter and disconnect it from the AC and DC power lines. Wait for five minutes to let the inverter DC capacitors discharge before opening the cabinet door. Ensure by measuring with a multimeter (impedance at least 1 Mohm) that there is no voltage present.
2. Undo the four fastening screws of the fan assembly plate.
3. Disconnect the fan wiring plug.
4. Undo the fan fastening screws.
5. Disconnect power supply and PE wires.
6. Install a new fan in reverse order.

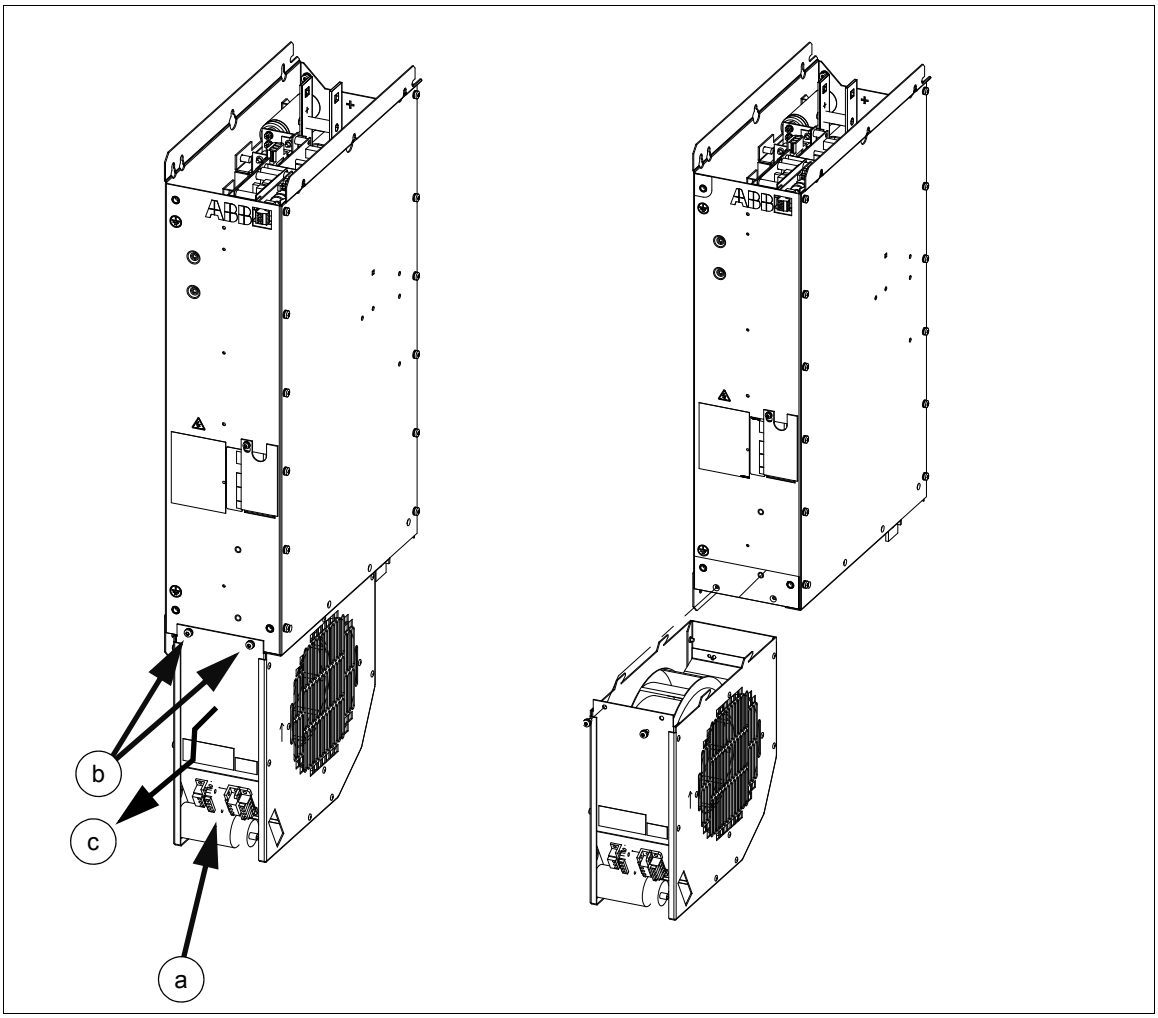




Replacing the cooling fan of the inverter module (R7i)

WARNING! Follow the safety instructions, page *11*. Ignoring the instructions can cause physical injury or death, or damage to the equipment.

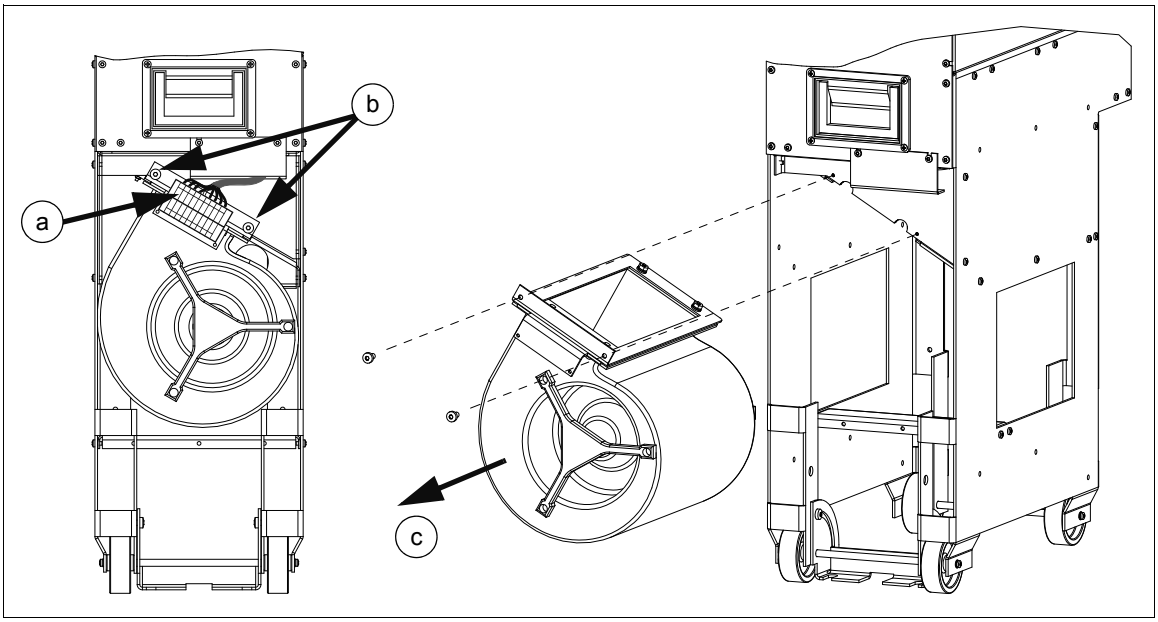
1. Repeat the seven steps safety precautions, page *12*. Stop the inverter and disconnect it from the AC and DC power lines. Wait for five minutes to let the inverter DC capacitors discharge before opening the cabinet door. Ensure by measuring with a multimeter (impedance at least 1 Mohm) that there is no voltage present.
2. Open the inverter cubicle door.
3. Disconnect the wire plug (a).
4. Remove the two screws holding the fan unit (b).
5. To free the fan, pull it slightly outwards, then downwards (c).
6. Install new fan in reverse order.



Replacing the cooling fan of the inverter module (R8i, 2 × R8i)

WARNING! Follow the safety instructions, page *11*. Ignoring the instructions can cause physical injury or death, or damage to the equipment.

1. Repeat the seven steps safety precautions, page *12*. Stop the inverter and disconnect it from the AC and DC power lines. Wait for five minutes to let the inverter DC capacitors discharge before opening the cabinet door. Ensure by measuring with a multimeter (impedance at least 1 Mohm) that there is no voltage present.
2. Open the inverter cubicle door.
3. Disconnect the fan wiring plug (a).
4. Remove the locking screws (b).
5. Pull the fan out along its sliding rails (c).
6. Install new fan in reverse order.

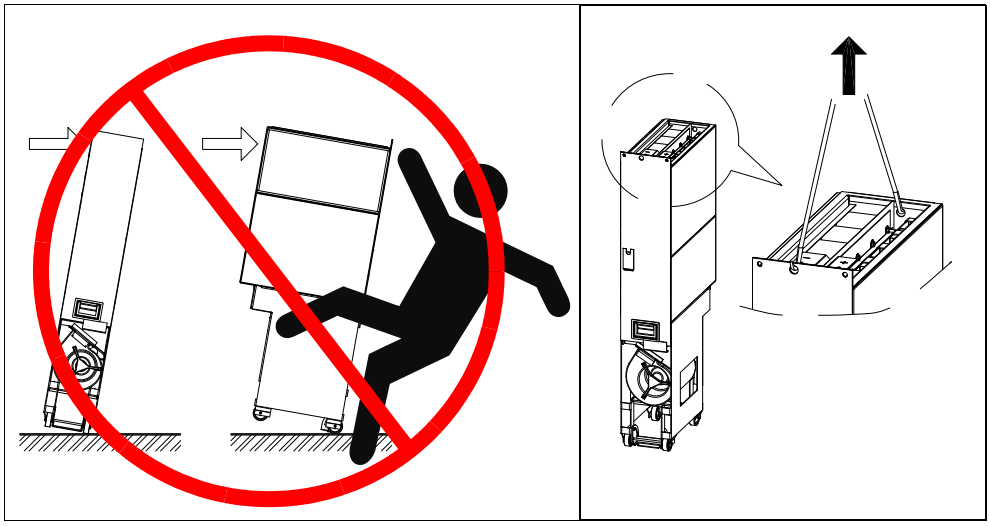


Replacing the inverter module (frames R8i, 2 × R8i)

WARNING! Follow the safety instructions, page *11*. Ignoring the instructions can cause physical injury or death, or damage to the equipment.

WARNING! Ignoring the following instructions can cause physical injury or death, or damage to the equipment.

- Use extreme caution when manoeuvering the inverter module. Extend the support legs of the module when it is removed from the cabinet! Do not tilt the module! The module is heavy and has a high center of gravity. It topples over easily if handled carelessly.
- Lift the module by the upper part only using the lifting hole(s) at the top!

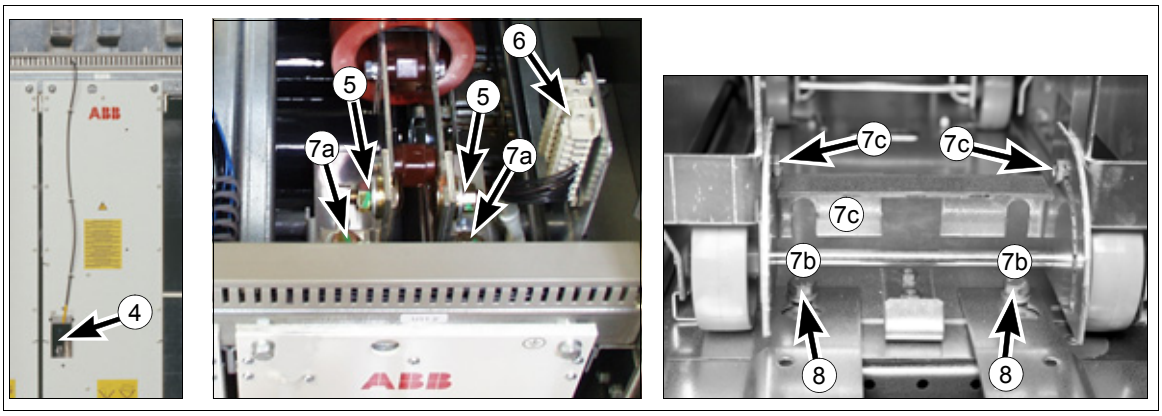


- Do not use the ramp with plinth heights over 50 mm.The ramp supplied with the inverter is designed for a plinth height of 50 mm (the standard plinth height of ABB cabinets). Tighten the four fastening bolts of the ramp carefully.

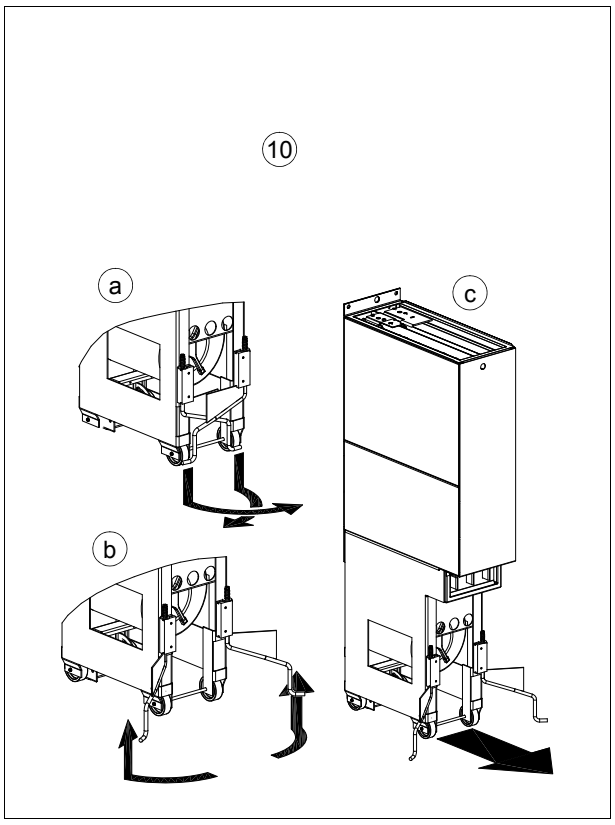
Extracting the module from the cubicle

1. Repeat the seven steps safety precautions, page *12*. Stop the inverter and disconnect it from the AC and DC power lines. Wait for five minutes to let the inverter DC capacitors discharge before opening the cabinet door. Ensure by measuring with a multimeter (impedance at least 1 Mohm) that there is no voltage present.
2. Open the cubicle door.
3. Remove any shrouds that protect the busbars and cable entries.
4. Open the transparent cover on the front of the inverter module (the rightmost module) and disconnect the fiber optic cables. Move the cables aside.
5. Remove the L-shaped DC busbars on top of the module.
6. Disconnect the terminal block (X50) next to the DC busbars.
7. Remove the two module fastening screws (7a) at the top. At the base of the module, loosen the two fastening bolts (7b) but leave them in place; lift the bracket (7c) and fasten it into the up position carefully.

8. Insert the module pull-out ramp under the two bolts at the base of the module and tighten the bolts carefully.



9. Pull the module carefully out of the cubicle along the ramp. Make sure the wires do not catch. While pulling on the handle, keep a constant pressure with one foot on the base of the module to prevent the module from tipping over. Use safety shoes with metal toe cap to avoid foot injury.
10. Extend the support legs of the module. Keep the legs extended until the module is about to be inserted back into the cubicle.



Inserting the module into the cubicle

1. Move the new inverter module close to the ramp, then retract the support legs of the module.
2. Push the module up the ramp back into the cubicle. Keep your fingers away from the edge of the module front plate to avoid pinching them between the module and the cubicle. Also, keep a constant pressure with one foot on the base of the module to stabilize the movement.
3. Refasten the module fixing screws at the top and reconnect the DC busbars. The tightening torque is 70 N·m for M12 screws.
4. Reconnect the cables (X50, fiber optic cables).
5. Loosen the module fastening bolts at the base of the module and remove the pull-out ramp. Flip the module fastening bracket into the down position and tighten the screws.
6. Close the cubicle door.

Replacing the LCL filter

Contact ABB.

Capacitors

The inverter intermediate circuit employs several electrolytic capacitors. Their lifespan depends on the inverter loading and ambient temperature. Capacitor life can be prolonged by lowering the ambient temperature. Capacitor life shortens in high ambient temperatures and under heavy loading.

It is not possible to predict a capacitor failure. Capacitor failure is usually followed by a mains fuse failure or a fault trip. Contact ABB if capacitor failure is suspected. Replacements are available from ABB. Do not use other than ABB-specified spare parts.

Reforming the capacitors

Reform (re-age) spare part capacitors once a year according to *Capacitor reforming instructions* (3BFE64059629 [English]).

11

Technical data

What this chapter contains

This chapter contains the technical data for the inverters.

Ratings

The inverter ratings are given below.

Inverter type PVS800-57-...	Frame size	Temp	Nominal ratings				
			$I_{N(AC)}$ A	$I_{max(DC)}$ A	$U_{N(AC)}$ V	$P_{N(AC)}$ kW	P_{pv} kW
0100kW-A	R7i	40 °C	195	245	300	100	120
0250kW-A	R8i	40 °C	485	600	300	250	300
0315kW-B	R8i	45 °C	520	615	350	315	380
0500kW-A	2×R8i	40 °C	965	1145	300	500	600
0630kW-B	2×R8i	45 °C	1040	1230	350	630	760

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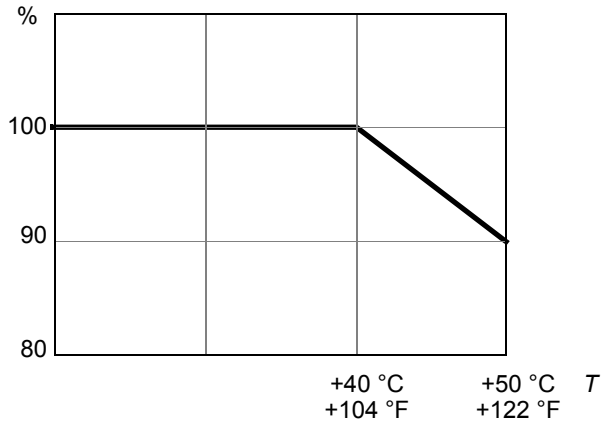
$I_{N(AC)}$	Continuous AC output current. Type -A inverters: No overloadability at 40 °C. Type -B inverters: No overloadability at 45 °C, 10% overloadability at 25 °C.
$P_{N(AC)}$	Continuous AC output power. Type -A inverters: No overloadability at 40 °C. Type -B inverters: No overloadability at 45 °C, 10% overloadability at 25 °C.
$I_{max(DC)}$	Maximum input current at nominal output power and ambient temperature
$U_{N(AC)}$	Nominal output voltage
P_{pv}	Recommended maximum input power to ensure full output power at normal radiation conditions. Inverter limits the power to a safe level.
Temp	Nominal ambient temperature. The values apply to this temperature.

Derating

The load capacity (current and power) decreases if the installation site altitude exceeds 1000 metres (3300 ft), or if the ambient temperature exceeds the nominal ambient temperature.

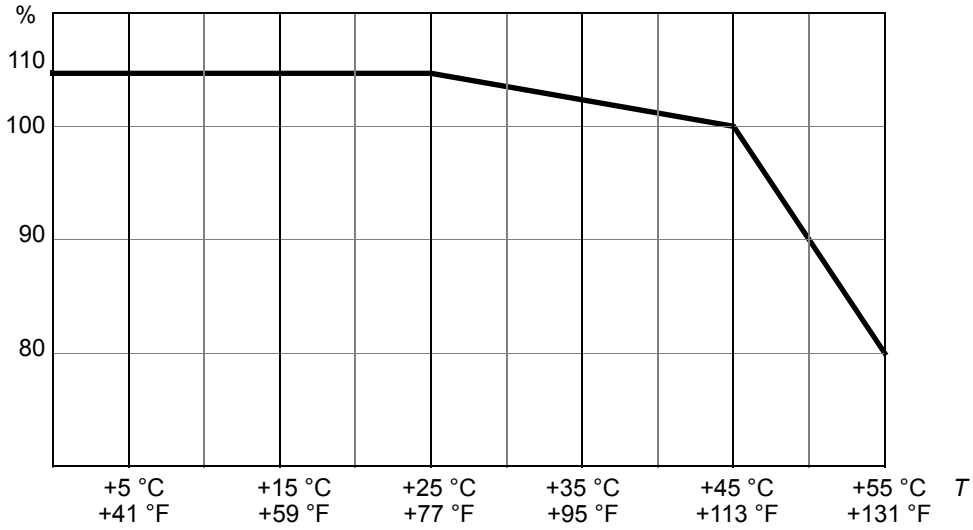
Temperature derating of types -0100kW-A, -0250kW-A and -0500kW-A

In the temperature range +40 °C (+104 °F) to +50 °C (+122 °F), the rated output current is decreased as shown below.



Temperature derating of types -0315kW-B and -0630kW-B

In the temperature range +45 °C (+113 °F) to +55 °C (+131 °F), the rated output current is decreased as shown below. 110% rated current is allowed below +25 °C (+77 °F).



Altitude derating

In altitudes from 1000 to 2000 m (3300 to 6562 ft) above sea level, the derating is 1% for every 100 m (328 ft). If the installation site is higher than 2000 m (6600 ft) above sea level, contact your local ABB distributor or office for further information.

Combined derating

Because altitude affects the maximum temperature, it is possible to compensate for the altitude derating value with a limited maximum ambient temperature. Each degree of maximum ambient temperature below the nominal ambient temperature gives a 1% compensation to the altitude derating.

Note: Maximum altitude is still limited to 2000 m (6562 ft).

Note: Use temperature compensation only for altitude derating. Nominal power must not be exceeded.

Example If the maximum ambient temperature of an inverter installed at 1800 m (5906 ft) is limited to +35 °C (95 °F), the derating factor is 100% - 8% + 5% = 97% or 0.97.

Type equivalence table

Inverter type	Frame size	Inverter module(s) used	LCL filter(s) used
PVS800-57-0100kW-A	R7i	PVS800-104-0105kW-A	SLCL-05
PVS800-57-0250kW-A	R8i	PVS800-104-0250kW-A	SLCL-15
PVS800-57-0315kW-B	R8i	PVS800-104-0315kW-B	SLCL-16
PVS800-57-0500kW-A	2×R8i	2×PVS800-104-0250kW-A	2×SLCL-15
PVS800-57-0630kW-B	2×R8i	2×PVS800-104-0315kW-B	2×SLCL-16

Fuses

Data for the factory-installed fuses are given in the tables below. Fuses from other manufacturers can be used if they meet the given ratings.

Main circuit AC fuses

Inverter type	Fuse information			
	Qty	Rated current (A)	Bussmann	Mersen
PVS800-57-0100kW-A	3	400	170M5808D	-
PVS800-57-0250kW-A	3	1000	170M6814D	6,9URD3PV1000
PVS800-57-0315kW-B	3	1000	170M6814D	6,9URD3PV1000
PVS800-57-0500kW-A	6	1000	170M6414	6,9URD33TTF1000
PVS800-57-0630kW-B	6	1000	170M6414	6,9URD33TTF1000

Inverter DC fuses

Inverter type	Fuse information			
	Qty	Rated current (A)	Bussmann	Mersen
PVS800-57-0100kW-A	2	400	170M6303	-
PVS800-57-0250kW-A	2	800	170M5398	11URD73PA0800
PVS800-57-0315kW-B	2	800	170M5398	11URD73PA0800
PVS800-57-0500kW-A	4	800	170M5398	11URD73PA0800
PVS800-57-0630kW-B	4	800	170M5398	11URD73PA0800

DC fuses for standard DC input connections

Inverter type	DC input connections	Fuse information			
	Qty	Qty	Rated current (A)	Bussmann	Mersen
PVS800-57-0100kW-A	1	2	400	170M4393	PC71UD13C400TF
PVS800-57-0250kW-A	2	4	400	170M4393	PC71UD13C400TF
PVS800-57-0315kW-B	2	4	500	170M4395	PC71UD11C500TF
PVS800-57-0500kW-A	4	8	400	170M4393	PC71UD13C400TF
PVS800-57-0630kW-B	4	8	500	170M4395	PC71UD11C500TF

DC fuses for 4 DC input connections (option +4H382)

Inverter type	Fuse information			
	Qty	Rated current (A)	Bussmann	Mersen
PVS800-57-0250kW-A	8	250	170M4390	PC71UD13C250TF
PVS800-57-0315kW-B	8	250	170M4390	PC71UD13C250TF

DC fuses for 8 DC input connections (option +8H382)

Inverter type	Fuse information			
	Qty	Rated current (A)	Bussmann	Mersen
PVS800-57-0250kW-A	16	160	170M4388	PC71UD13C160TF
PVS800-57-0315kW-B	16	160	170M4388	PC71UD13C160TF
PVS800-57-0500kW-A	16	250	170M4390	PC71UD13C250TF
PVS800-57-0630kW-B	16	250	170M4390	PC71UD13C250TF

DC fuses for 12 DC input connections (option +12H382)

Inverter type	Fuse information			
	Qty	Rated current (A)	Bussmann	Mersen
PVS800-57-0500kW-A	24	160	170M4388	PC71UD13C160TF
PVS800-57-0630kW-B	24	160	170M4388	PC71UD13C160TF

Miniature DC circuit breakers (option +H377)

Inverter type	Breaker information	
	Qty	ABB
PVS800-57-0100kW-A	4	S804PV-S80
PVS800-57-0250kW-A	8	S804PV-S100
PVS800-57-0500kW-A	16	S804PV-S100

Miniature circuit breakers for options +G300 and +G410

Option	Breaker
+G300	S 202-K6
+G410	DS201-C6A30

Dimensions, weights and free space requirements

Dimensions and weights of the standard cabinet are given below.

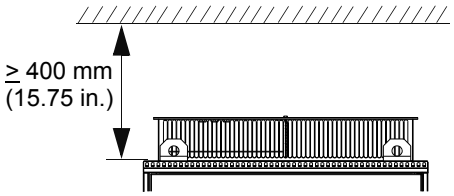
Inverter type PVS800-57-…	Height		Width		Depth*		Weight	
	mm	in.	mm	in.	mm	in.	kg	lb
0100kW-A	2130	83.84	1030	40.55	690	27.17	600	1300
0250kW-A	2130	83.84	1830	72.05	680	26.77	1100	2400
0315kW-B	2130	83.84	1830	72.05	680	26.77	1100	2400
0500kW-A	2130	83.84	2630	103.54	708	27.87	1800	4000
0630kW-B	2130	83.84	2630	103.54	708	27.87	1800	4000

* door equipment such as switches and air inlet gratings excluded

Widths and weights of the cabinets with options are given below.

Width (mm)				Weight (kg)			
+H377	+4H382	+8H382	+12H382	+H377	+4H382	+8H382	+12H382
1030	-	-	-	700	-	-	-
1830	1830	2230	-	1200	1200	1320	-
1830	1830	2230	-	1200	1200	1320	-
3030	-	3030	3430	2200	-	1920	2040
3030	-	3030	3430	2200	-	1920	2040

Required free space around the unit for cooling							
Front		Side		Above		Back	
mm	in.	mm	in.	mm	in.	mm	in.
150	5.91	-	-	400	19.68	-	-



Required free space for door opening: see chapter *Dimension drawings*.

Losses, cooling data and noise

The inverter is cooled by an internal fan, flow direction from front to top.

Inverter type	Heat dissipation *	Cooling air flow **		Noise
	kW	m^3/h	ft^3/h	dB
PVS800-57-0100kW-A	4	1300	46000	75
PVS800-57-0250kW-A	10	3200	113000	75***
PVS800-57-0315kW-B	10	3200	113000	75***
PVS800-57-0500kW-A	20	5800	205000	75***
PVS800-57-0630kW-B	20	5800	205000	75***

* for dimensioning the ventilation of the electric equipment room

** cooling air flow for a cabinet with one DC input cubicle only

*** at partial power typically < 65 dB with speed-controlled fans

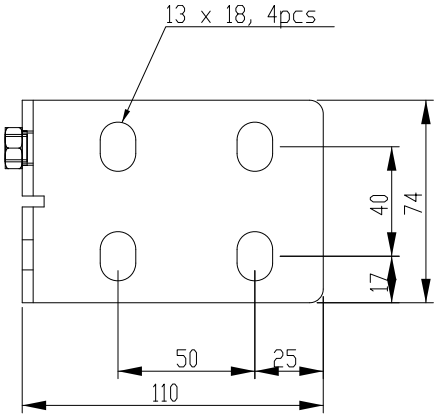
Filter material in the inlet (door) grating: airTex G150 288 mm × 292 mm, 688 mm × 521 mm

Terminal and lead-through data for the DC input power cable

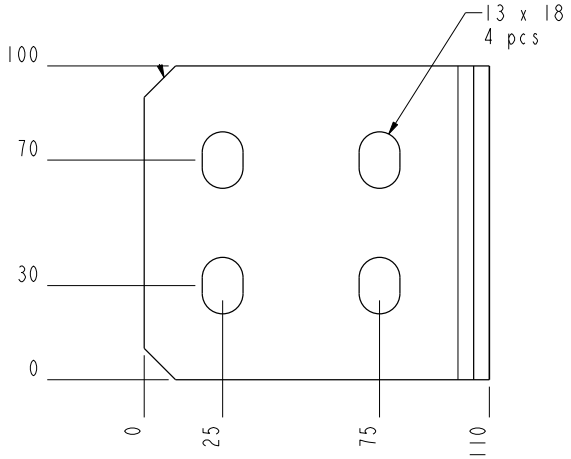
Inverter type	No. of cable lead-throughs Ø60 mm (2.36”)				
	Units with fuse-protected DC input connections				Units with MCB-protected DC input connections (+H377)
	Standard	+4H382	+8H382	+12H382	
PVS800-57-0100kW-A	1 × 3	-	-	-	3 × 3
PVS800-57-0250kW-A	4 × 4	4 × 4	8 × 4	-	4 × 4
PVS800-57-0315kW-B	4 × 4	4 × 4	8 × 4	-	-
PVS800-57-0500kW-A	4 × 4	-	8 × 4	12 × 4	8 × 4
PVS800-57-0630kW-B	4 × 4	-	8 × 4	12 × 4	-

The DC input power cable terminal data is given in the table below.

Units with fuse-protected DC input connections								
	DC busbars						PE busbar	
Inverter type PVS800-57-	Pcs (plus + minus)				Bolt size	Tightening torque	Bolt size	Tightening torque
	Standard	+4H382	+8H382	+12H382				
0100kW-A	2	-	-	-	M12 or ½”	70 N·m (50 lb·ft)	M10 or 3/8”	30…44 N·m (2…32 lb·ft)
0250kW-A	4	8	16	-				
0315kW-B	4	8	16	-				
0500kW-A	8	-	16	24				
0630kW-B	8	-	16	24				



Terminals of PVS800-57-0100kW-A



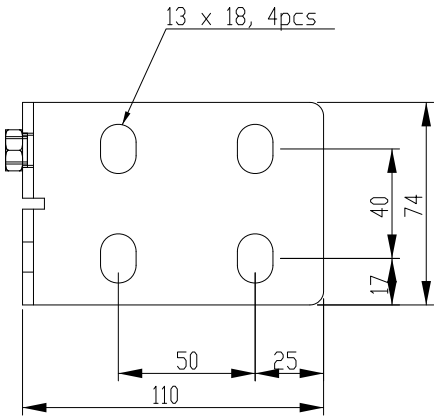
Terminals of PVS800-57-0250kW-A, -0315kW-B, -0500kW-A and -0630kW-B

Units with MCB-protected DC input connections (option +H377)					
Inverter type PVS800-57-	Photovoltaic switches			PE busbar	
	Pcs	Max. wire size (mm^2)	Tightening torque	Bolt size	Tightening torque
0100kW-A	4	6…50 (stranded cable) 6…70 (solid cable)	3…4 N·m (2.2… 3.0 lb·ft)	M10 (3/8”)	30…44 N·m (2…32 lb·ft)
0250kW-A	8				
0500kW-A	16				

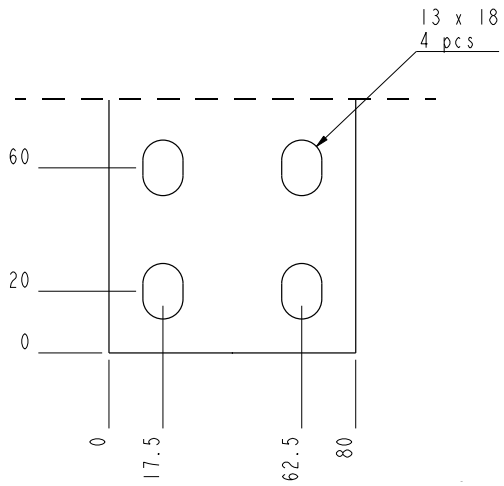
Terminal and lead-through data for the AC output power cable

Inverter type	No. of cable lead-throughs Ø60 mm (2.36”)
PVS800-57-0100kW-A	3
PVS800-57-0250kW-A	2 × 3
PVS800-57-0315kW-B	2 × 3
PVS800-57-0500kW-A	3 × 3
PVS800-57-0630kW-B	3 × 3

AC busbars			PE busbar	
Pcs	**Bolt size**	**Tightening torque**	**Screw**	**Tightening torque**
3	M12 or ½”	70 N·m (50 lb·ft)	M10 (3/8”)	30…44 N·m 2…32 lb·ft)



Terminals of PVS800-57-0100kW-A



Terminals of PVS800-57-0250kW-A, -0315kW-B, -0500kW-A and -0630kW-B

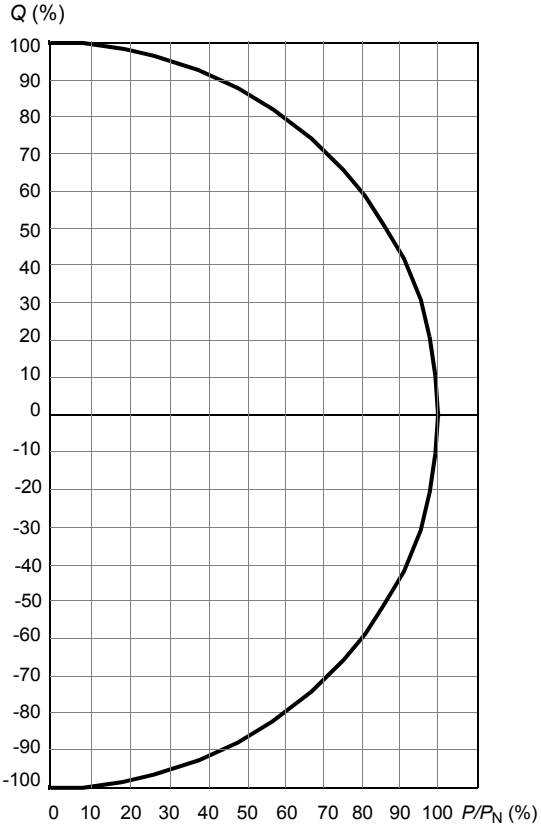
AC output connection specification

Voltage	Types -0100kW-A, -0250kW-A and -0500kW-A: 300 V AC 3-phase ± 10% Types -0315kW-B and -0630kW-B: 350 V AC 3-phase ± 10%
Allowed electrical system type	3-phase IT (ungrounded) system. Galvanic isolation for each inverter is needed.
Transformer	The transformer must be suitable for IGBT-based inverter use with high d*u*/d*t* values against the ground. Dedicated low-voltage winding is needed for each inverter. Static screen between windings with proper dimensioning is needed. For details on selecting the transformer, see *Selecting the transformer* on page *53*.
Short-circuit withstand strength (IEC 60439-1)	Type -0100kW-A: Maximum allowable prospective short-circuit current is 10 kA when protected by fuses given in fuse tables. Types -0250kW-A, -0500kW-A, -0315kW-B and -0630kW-B: Maximum allowable prospective short-circuit current is 50 kA when protected by fuses given in fuse tables. When temporary grounding for work is applied (the grounding cables are connected to the connecting knobs of the AC and DC busbars and PE of the inverter): the maximum allowable prospective short-circuit current is decreased to 25 kA / 1 s. If the connected grounding cables and clamps are not equivalent to the prospective short-circuit rating of the inverter, the total rating will be lower.
Frequency	48 to 63 Hz withstand with normal dimensioning (grid-compliance may require disconnection at smaller values.) Maximum rate of change 17%/s
Imbalance	Max. ± 3% of nominal phase to phase AC line voltage
Voltage dips	Max. 25% **Note:** If the inverter is expected to survive voltage dips (low-voltage ride-through), auxiliary power supply must be ensured, for example, by an uninterruptible power supply.
Fundamental power factor (cos phi$_1$)	1

Power factor (cos phi$_1$) adjustment range	0…1 capacitive or inductive depending on the dimensioning

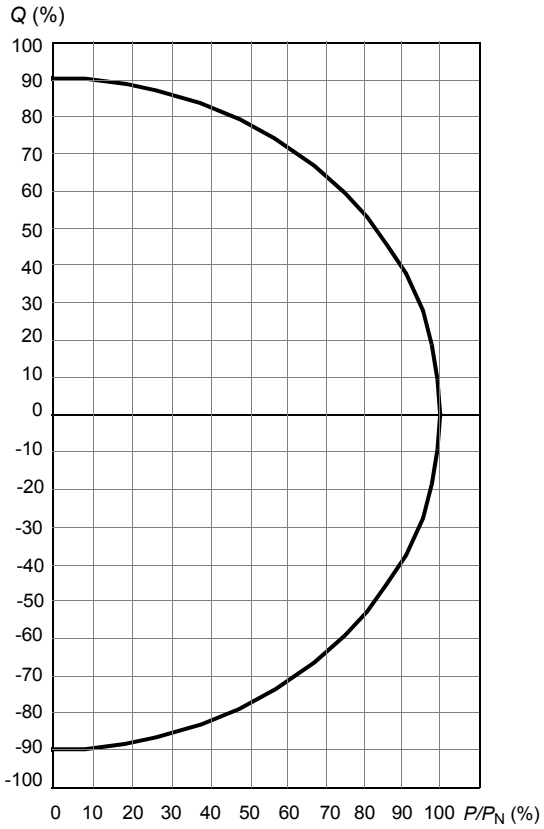
Types -0250kW-A and -0500kW-A

$Q_{max} = \sqrt{10\,000 - P_{act}^2}$



Types -0315kW-B and -0630kW-B

$Q_{max} = \sqrt{0.9 \cdot 10\,000 - P_{act}^2}$



Q Reactive power in percentage of nominal active power

P/P_N Relative active power

Current	See section *Ratings*.
Overvoltage category (IEC 62109)	3 (With option +F263, the category is 1.)
Harmonic distortion	THD current < 3% at nominal load

DC input connection data

Maximum DC power (P_{pv})	See section *Ratings*.
Maximum DC current ($I_{max(DC)}$)	See section *Ratings*.
Maximum DC voltage ($U_{max(DC)}$)	1000 V DC
Operational DC voltage range, $U_{mppt(DC)}$	Types -0100kW-A, -0250kW-A and -0500kW-A: 450…825 V DC Types -0315kW-B and -0630kW-B: 525…825 V DC
Voltage ripple	< 3%
Overvoltage category (IEC 62109)	2

Auxiliary power connection data

Voltage	230 V AC (115 V AC optional)
Frequency	50/60 Hz
Allowed electrical system	TN-S (grounded) system. If IT (ungrounded) system, contact ABB for instructions.

Overvoltage category (IEC 62109)	2

Control unit (RDCU/RMIO) connection data

Analog inputs

	RDCU (A43, PVS800 master control program): one programmable differential current input (0 mA / 4 mA … 20 mA, R_{in} = 100 ohm). **RDCU (A41, PVS800 inverter control program):** two programmable differential current input (0 mA / 4 mA … 20 mA, R_{in} = 100 ohm) and one programmable differential voltage input (-10 V ... +10 V, R_{in} = 200 kohm). The analog inputs are galvanically isolated as a group.
Insulation test voltage	500 V AC, 1 min
Max. common mode voltage between the channels	±15 V DC
Common mode rejection ratio	≥ 60 dB at 50 Hz
Resolution	0.025% (12 bit) for the -10 V … +10 V input. 0.5% (11 bit) for the 0…+10 V and 0…20 mA inputs.
Inaccuracy	±0.5% (Full Scale Range) at 25 °C (77 °F). Temperature coefficient: ±100 ppm/°C (±56 ppm/°F), max.

Constant voltage output

Voltage	+10 V DC, 0, -10 V DC ± 0.5% (Full Scale Range) at 25 °C (77 °F). Temperature coefficient: ±100 ppm/°C (±56 ppm/°F) max.
Maximum load	10 mA
Applicable potentiometer	1 kohm to 10 kohm

Auxiliary power output

Voltage	24 V DC ± 10%, short circuit proof
Maximum current	250 mA (shared between this output and optional modules installed on the RMIO)

Analog outputs

	Two programmable current outputs: 0 (4) to 20 mA, R_L ≤ 700 ohm
Resolution	0.1% (10 bit)
Inaccuracy	±1% (Full Scale Range) at 25 °C (77 °F). Temperature coefficient: ±200 ppm/°C (±111 ppm/°F) max.

Digital inputs

	RDCU (A43, PVS800 master control program): two programmable digital inputs (common ground: 24 V DC, -15% to +20%) and a start interlock input. Group isolated, can be divided in two isolated groups (see *Isolation and grounding diagram* below). **RDCU (A41, PVS800 inverter control program):** one programmable digital input (common ground: 24 V DC, -15% to +20%) and a start interlock input. Group isolated, can be divided in two isolated groups (see *Isolation and grounding diagram* below). Internal supply for digital inputs (+24 V DC): short-circuit proof. An external 24 V DC supply can be used instead of the internal supply.
Insulation test voltage	500 V AC, 1 min
Logical thresholds	< 8 V DC ≙ “0”, > 12 V DC ≙ “1”
Input current	DI1 to DI 5: 10 mA, DI6: 5 mA
Filtering time constant	1 ms

Relay outputs

	RDCU (A43, PVS800 master control program): two programmable relay outputs, or with option +Q951 one programmable relay output **RDCU (A41, PVS800 inverter control program):** without option +Q954 one programmable relay output
Switching capacity	8 A at 24 V DC or 250 V AC, 0.4 A at 120 V DC
Minimum continuous current	5 mA rms at 24 V DC
Maximum continuous current	2 A rms
Insulation test voltage	4 kV AC, 1 minute

DDCS fiber optic link

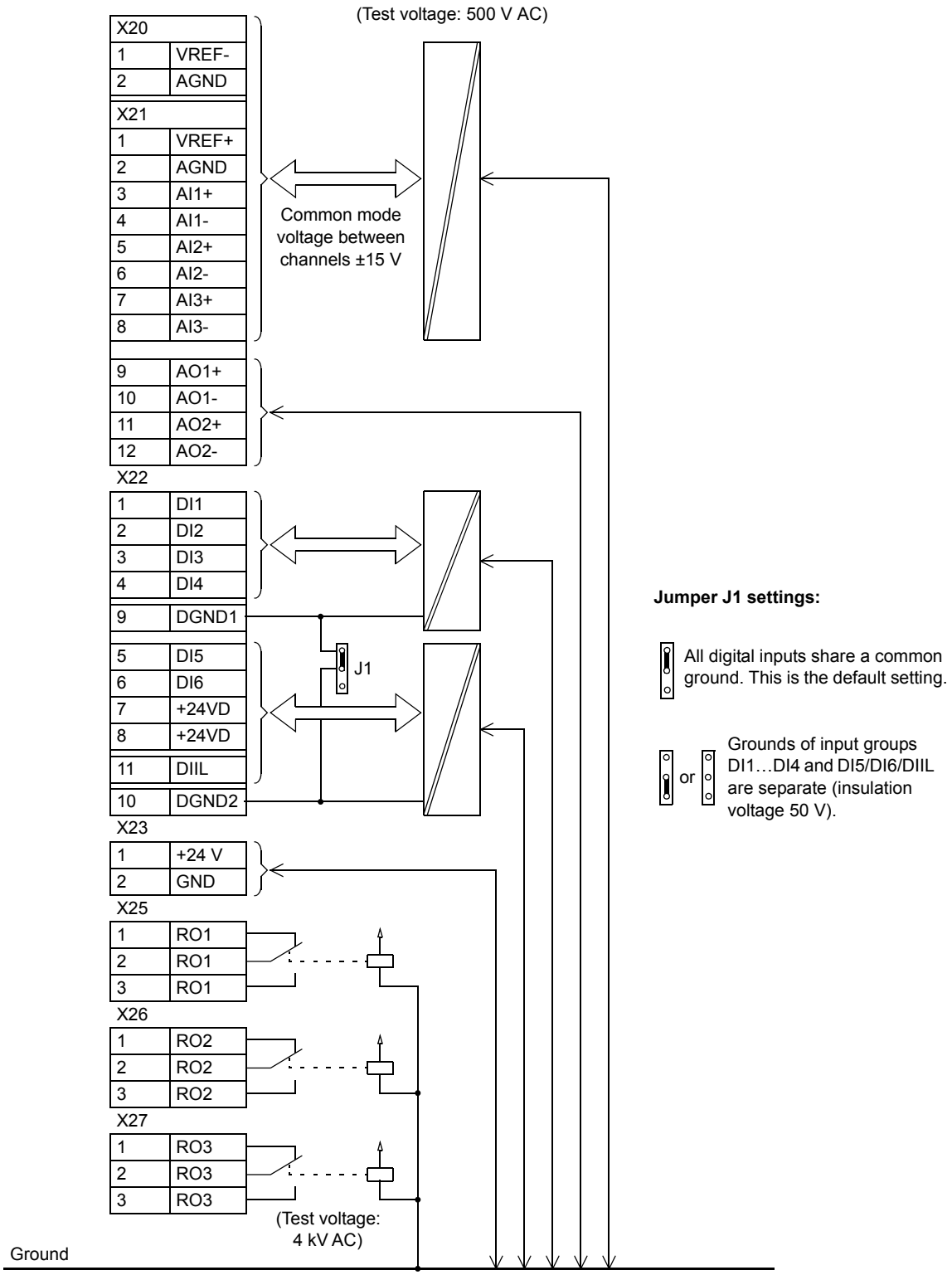
	With optional communication adapter module RDCO. Protocol: DDCS (ABB Distributed Drives Communication System)

24 V DC power input

Voltage	24 V DC ± 10%
Typical current consumption (without optional modules)	250 mA
Maximum current consumption	1200 mA (with optional modules inserted)

The terminals on the RMIO board as well as on the optional modules attachable to the board fulfil the Protective Extra Low Voltage (PELV) requirements stated in EN 50178 provided that the external circuits connected to the terminals also fulfil the requirements and the installation site is below 2000 m (6562 ft). Above 2000 m (6562 ft), see page *100*.

Isolation and grounding diagram



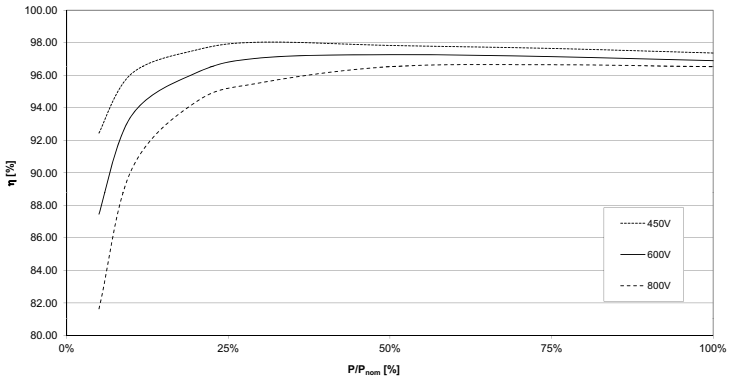
Efficiency

All values below are without auxiliary power consumption. The inverter complies with efficiency standards IEC 61683 and EN 50530.

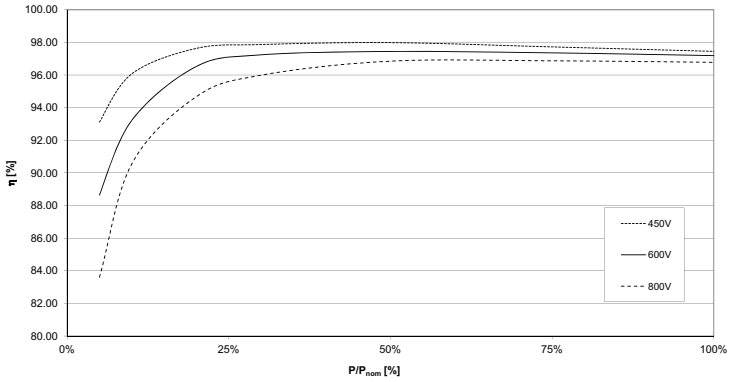
Maximum efficiency	**DC voltage**		
	450 V	600 V	800 V
PVS800-57-0100kW-A	98.0	97.3	96.6
PVS800-57-0250kW-A	98.0	97.4	96.9
PVS800-57-0500kW-A	98.6	98.1	97.6

European (EURO-eta) efficiency	**DC voltage**		
	450 V	600 V	800 V
PVS800-57-0100kW-A	97.5	96.5	95.3
PVS800-57-0250kW-A	97.6	96.7	95.7
PVS800-57-0500kW-A	98.2	97.5	96.5

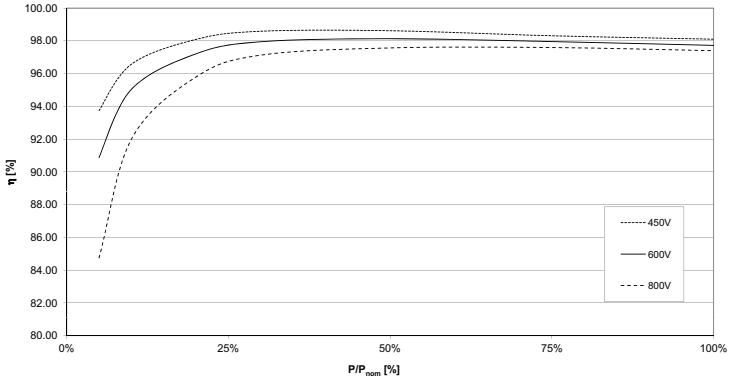
PVS800-57-0100kW-A efficiency



PVS800-57-0250kW-A efficiency



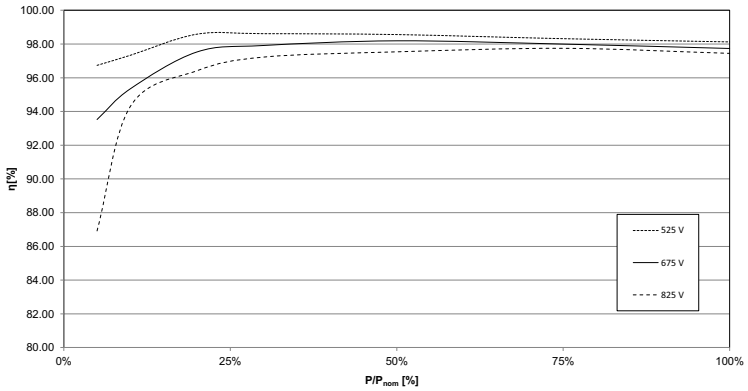
PVS800-57-0500kW-A efficiency



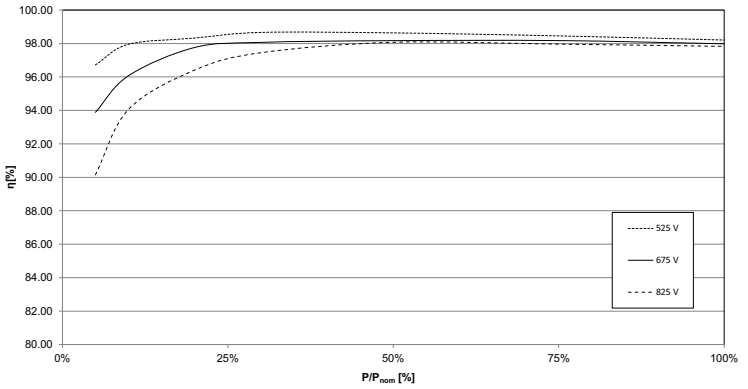
Maximum efficiency	DC voltage		
	525 V	675 V	825 V
PVS800-57-0315kW-B	98.6	98.2	97.7
PVS800-57-0630kW-B	98.6	98.2	98.1

European (EURO-eta) efficiency	DC voltage		
	525 V	675 V	825 V
PVS800-57-0315kW-B	98.3	97.7	96.8
PVS800-57-0630kW-B	98.4	97.8	97.3

PVS800-57-0315kW-B efficiency



PVS800-57-0630kW-B efficiency



Degrees of protection

IP 42 (UL type 2)

Ambient conditions

Environmental limits for the inverter are given below. The inverter is to be used in a heated, **indoor, controlled** environment.

Note: If the installation has ventilation ducts directly to outdoors (eg, a container installation), back flow of moist and dusty air must be prevented. See section *Ventilation duct at the air outlet of the cabinet* on page *49*.

	Operation installed for stationary use	**Storage** in the protective package	**Transportation** in the protective package
Installation site altitude	0 to 2000 m (6562 ft) above sea level (above 1000 m ([281 ft], see section *Derating*)	-	-
Air temperature	Types -0100kW-A, -0250kW-A, -0500kW-A: -15 to +50 °C (5 to 122 °F). Types -0315kW-B and -0630kW-B: -15 to +55 °C (5 to 131 °F) No frost allowed. See section *Derating*.	-40 to +70 °C (-40 to +158 °F)	-40 to +70 °C (-40 to +158 °F)
Relative humidity	5 to 95%	Max. 95%	Max. 95%
	No condensation allowed. Maximum allowed relative humidity is 60% in the presence of corrosive gases.		
Environmental category (IEC 62109-1)	Indoor conditioned		
Wet conditions (IEC 62109-1)	Not to be used in wet location. The installation location must be dry.		
Pollution degree (IEC 62109-1)	2. Normally only non-conductive pollution is allowed.		
Contamination levels (IEC 60721-3-3, IEC 60721-3-2, IEC 60721-3-1)	No conductive dust allowed.		
	Chemical gases: Class 3C1 Solid particles: Class 3S2	Chemical gases: Class 1C2 Solid particles: Class 1S3	Chemical gases: Class 2C2 Solid particles: Class 2S2
Atmospheric pressure	70 to 106 kPa 0.7 to 1.05 atmospheres	70 to 106 kPa 0.7 to 1.05 atmospheres	60 to 106 kPa 0.6 to 1.05 atmospheres
Vibration (IEC 60068-2)	Max. 1 mm (0.04 in.) (5 to 13.2 Hz), max. 7 m/s^2 (23 ft/s^2) (13.2 to 100 Hz) sinusoidal	Max. 1 mm (0.04 in.) (5 to 13.2 Hz), max. 7 m/s^2 (23 ft/s^2) (13.2 to 100 Hz) sinusoidal	Max. 3.5 mm (0.14 in.) (2 to 9 Hz), max. 15 m/s^2 (49 ft/s^2) (9 to 200 Hz) sinusoidal
Shock (IEC 60068-2-27)	Not allowed	Max. 100 m/s^2 (330 $ft./s^2$), 11 ms	Max. 100 m/s^2 (330 $ft./s^2$), 11 ms
Free fall	Not allowed	100 mm (4 in.) for weight over 100 kg (220 lb)	100 mm (4 in.) for weight over 100 kg (220 lb)

Materials

Cabinet	Hot-dip zinc-coated (thickness approximately 20 micrometers) steel sheet (thickness 1.5 mm) with polyester thermosetting powder coating (thickness approximately 80 micrometers) on visible surfaces except back panel. Color: RAL 7035 (light beige, semigloss).
Busbars	Tin- or silver-plated copper
Fire safety of materials (IEC 60332-1)	Insulating materials and non-metallic items: mostly self-extinctive
Package	Frame: Wood or plywood. Plastic wrapping: PE-LD. Bands: PP or steel.
Disposal	The inverter contains raw materials that should be recycled to preserve energy and natural resources. The package materials are environmentally compatible and recyclable. All metal parts can be recycled. The plastic parts can either be recycled or burned under controlled circumstances, according to local regulations. Most recyclable parts are marked with recycling marks. If recycling is not feasible, all parts excluding electrolytic capacitors and printed circuit boards can be landfilled. The DC capacitors (C1-1 to C1-x) contain electrolyte and the printed circuit boards contain lead, both of which are classified as hazardous waste within the EU. They must be removed and handled according to local regulations. For further information on environmental aspects and more detailed recycling instructions, please contact your local ABB distributor.

Auxiliary circuit power consumption

The auxiliary circuit must be supplied by the customer galvanically separated from inverter output.

Inverter type	Total in running (W)	Total in stand-by (W)
PVS800-57-0100kW-A	310	60
PVS800-57-0250kW-A	310	60
PVS800-57-0315kW-B	310	60
PVS800-57-0500kW-A	520	70
PVS800-57-0630kW-B	520	70

Notes:

- The values above do not include the cooling fans of the inverter modules. Their power is taken from the solar generator.
- Every additional incoming cubicle increases the auxiliary power consumption by 50 W.
- The actual consumption depends on the options installed.
- Option +G300
  PVS800-57-0100kW-A: max. 150 W
  PVS800-57-0250kW-A and PVS800-57-0315kW-B: max. 250 W
  PVS800-57-0500kW-A: 350 W; PVS800-57-0630kW-B: max. 400 W
  The actual power consumption depends on temperature.
- Option +G410: Maximum power consumption 20 W per junction box.
- The auxiliary circuit has to be protected with 16 A gG fuses. See the circuit diagrams delivered with the inverter.

Applicable standards and requirements

	The inverter complies with the standards below.
IEC/EN 62109-1:2010	*Safety of power converters for use in photovoltaic power systems Part 1: General requirements*
EN 50530:2010	*Overall efficiency of photovoltaic inverters*
IEC/EN 60529:1992	*Degrees of protection provided by enclosures (IP code)*
IEC/EN 61000-6-2:2005	*Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments*
IEC/EN 61000-6-4:2007	*Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments*
NEMA 250 (2003)	*Enclosures for Electrical Equipment (1000 Volts Maximum)*
IEC 61683:1999	*Photovoltaic systems – Power conditioners – Procedure for measuring efficiency*
IEC 62116:2008	*Test procedure of islanding prevention measures for utility-interconnected photovoltaic inverters*
BDEW: 2008	*Technical guideline – Generating plants connected to the medium voltage network*
French Order: 2008 (NOR: DEVE08088815A)	*French Ministerial Order for electrical energy generating facilities*
VDE 0126-1-1	*Automatic disconnection device between a generator and the public low-voltage grid*

CE marking

A CE mark is attached to the inverter to verify that the unit follows the provisions of the European Low Voltage and EMC Directives.

Compliance with the European Low Voltage Directive

The compliance with the European Low Voltage Directive has been verified according to standard EN 62109.

Compliance with the European EMC directive

The EMC Directive defines the requirements for immunity and emissions of electrical equipment used within the European Union. EMC standards EN 61000-6-2:2005 and EN 61000-6-4:2007 cover requirements stated for electrical and electronic apparatus intended for use in industrial environments.

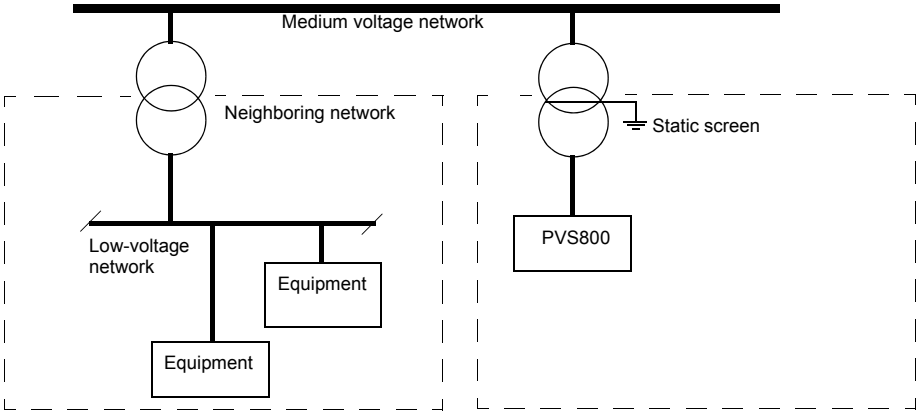
Compliance with EMC standards EN 61000-6-2:2005 and EN 61000-6-4:2007

EMC stands for **E**lectro**m**agnetic **C**ompatibility. It is the ability of electrical/electronic equipment to operate without problems within an electromagnetic environment. Likewise, the equipment must not disturb or interfere with any other product or system within its locality.

Medium voltage network

The requirements of the EMC Directive can be met as follows:

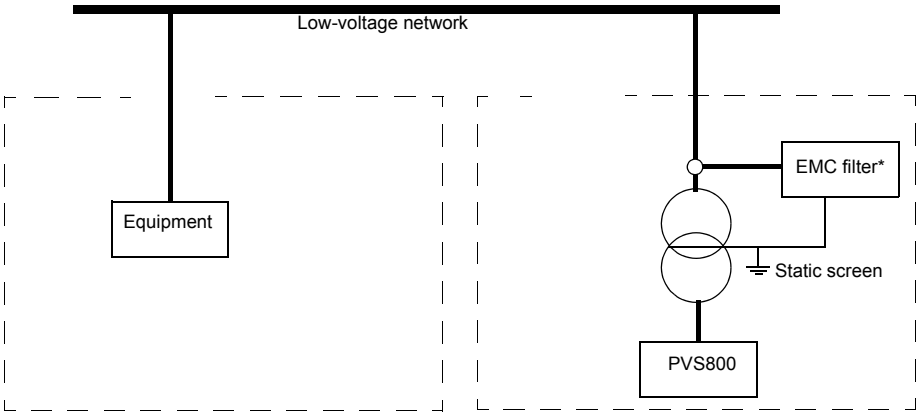
1. A transformer with static screening between the primary and secondary windings is used to ensure that no excessive emission is propagated to neighboring low-voltage networks.
2. The inverter is installed to an IT (ungrounded) system according to the instructions given in the hardware manual.



Low-voltage network

The requirements of the EMC Directive can be met as follows:

1. A transformer with static screening between the primary and secondary windings is used to ensure that no excessive emission is propagated to neighboring low-voltage networks.
2. The low-voltage network is of the TN type (grounded).
3. The EMC filter (option +E216) is installed on network side of the low-voltage transformer.
4. The inverter is installed according to the instructions given in the hardware manual.



* option +E216

“C-tick” marking

“C-tick” marking is required in Australia and New Zealand. A “C-tick” mark is attached to the inverter to verify compliance with the relevant standards IEC/EN 61000-6-2:2005 and IEC/EN 61000-6-4:2007, mandated by the Trans-Tasman Electromagnetic Compatibility Scheme.

For fulfilling the requirements of the standard, see section *Compliance with the European EMC directive* on page *115*.

VDE marking

A VDE mark is attached to the inverters with option +C178. The VDE mark verifies that the unit follows the provisions of the German VDE 0126-1-1 standard that specifies the grid connection parameters and safety functions for German low-voltage network.

Golden Sun marking

A Golde Sun mark is attached to the inverters with option +C177. The Golden Sun mark verifies that the solar inverter is allowed to be connected to a Chinese electricity network. The Golden Sun certification program specifies safety and performance criteria and tests for solar inverters.

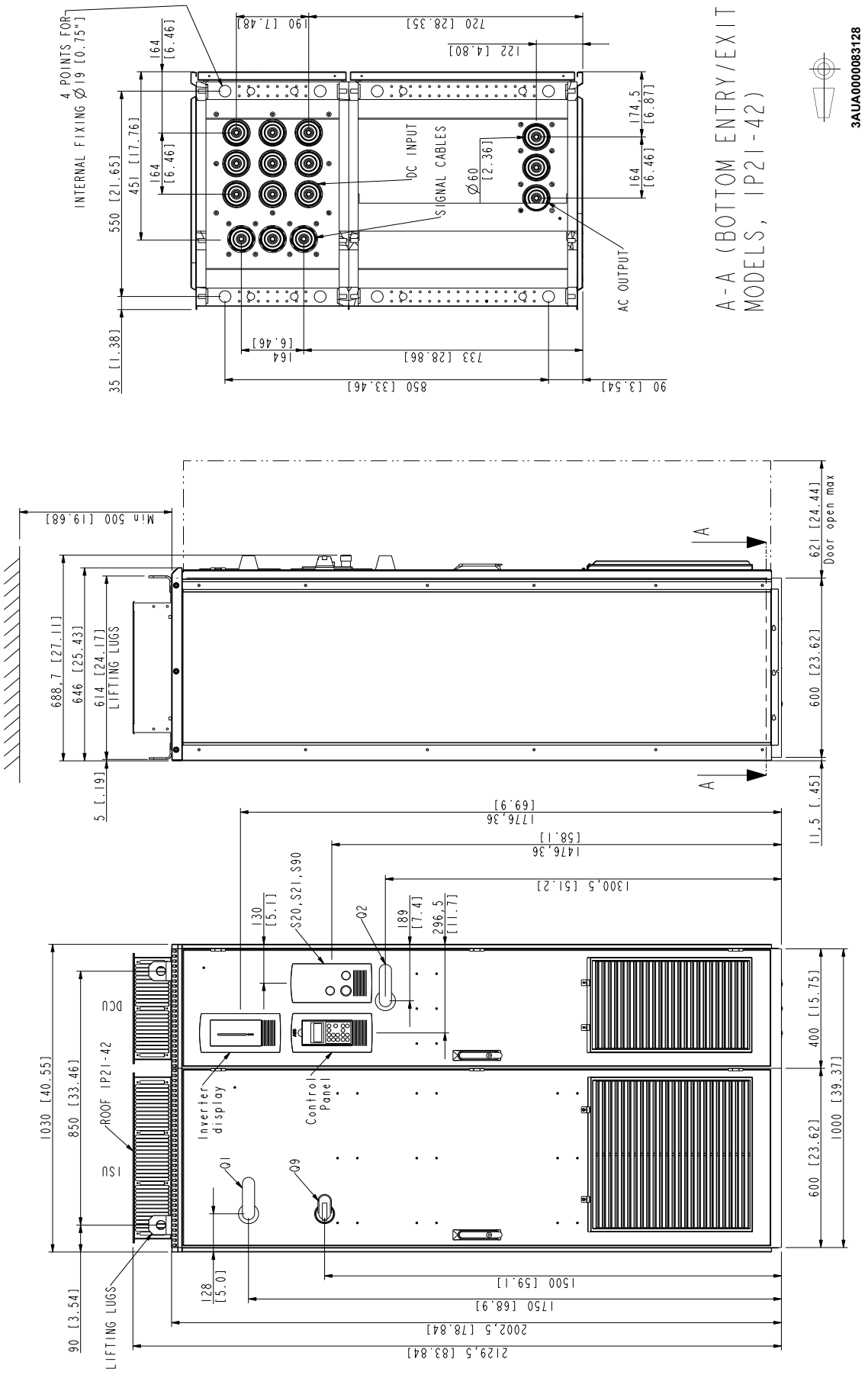
12

Dimension drawings

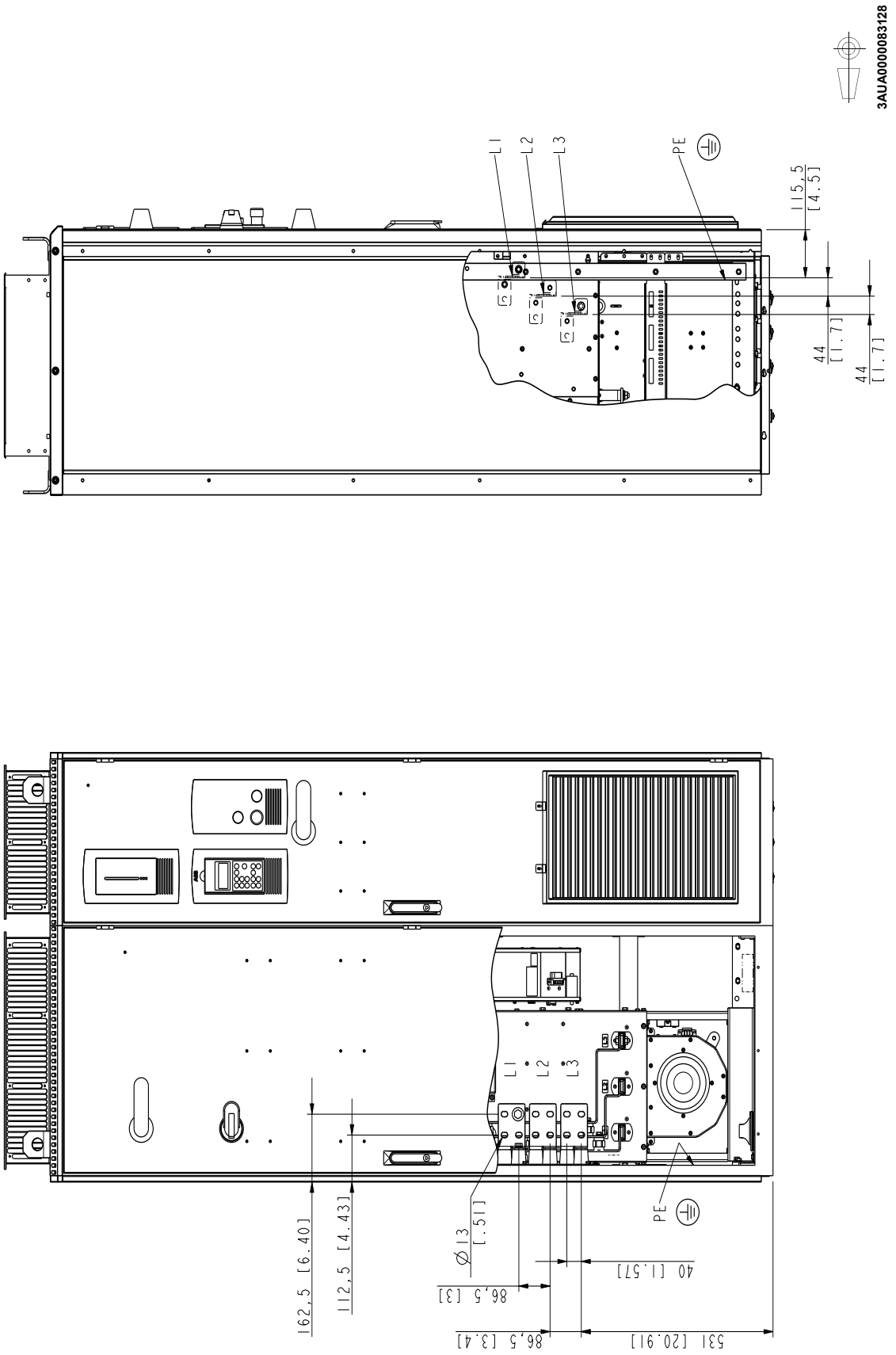
What this chapter contains

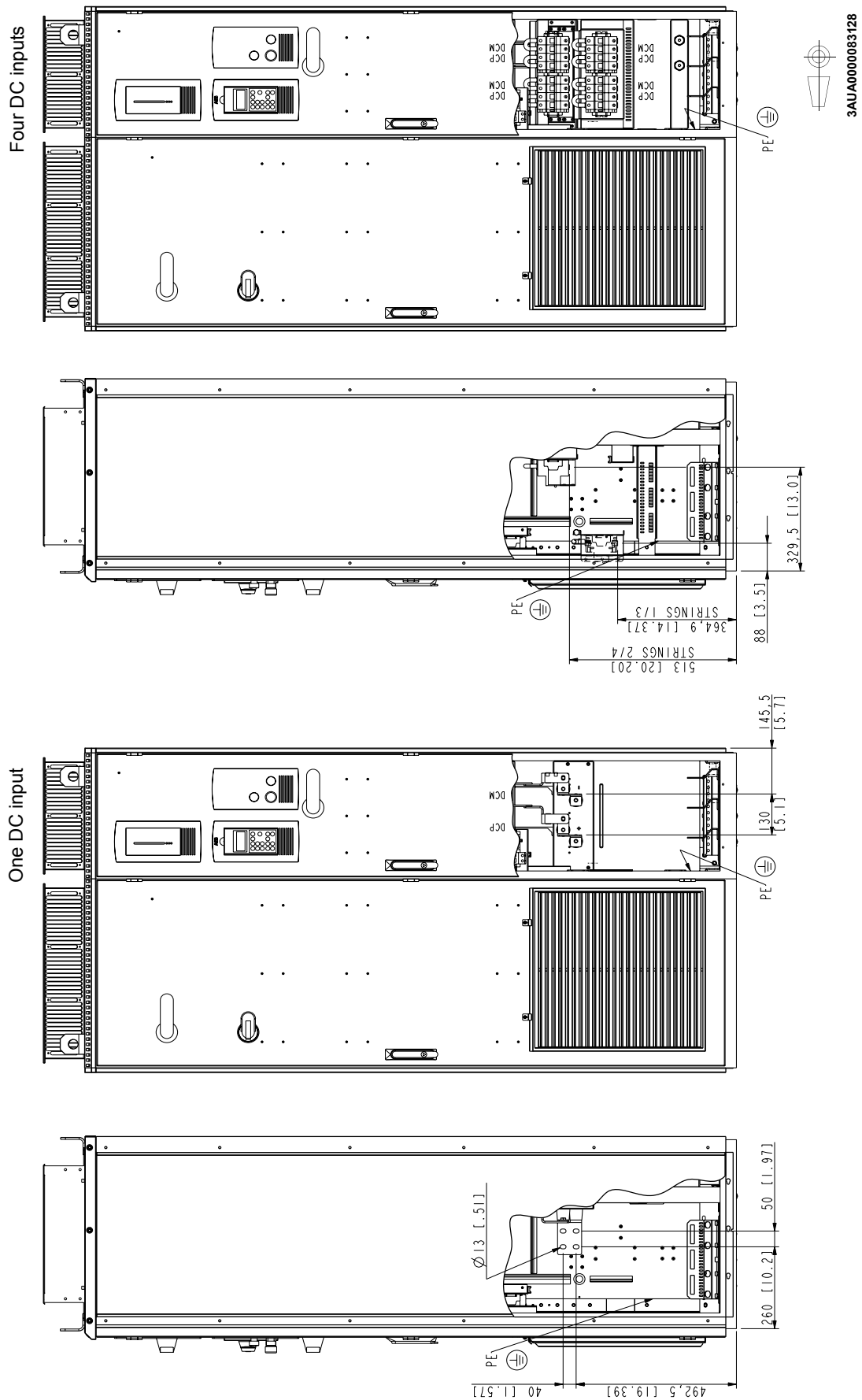
This chapter contains example dimension drawings of the inverter.

Frame R7i


4 POINTS FOR
INTERNAL FIXING Ø19 [0.75"]
90 [7.48]
720 [28.35]
122 [4.80]
164
[6.46]
174.5
[6.87]
550 [21.65]
451 [17.76]
DC INPUT
SIGNAL CABLES
Ø60
[2.36]
AC OUTPUT
35 [1.38]
733 [28.86]
850 [33.46]
90 [3.54]
A-A (BOTTOM ENTRY/EXIT
MODELS, IP21-42)
3AUA0000083128
Min 500 [19.68]
621 [24.44]
Door open max
688,7 [27.11]
646 [25.43]
614 [24.17]
LIFTING LUGS
600 [23.62]
5 [.19]
11,5 [.45]
1776,36
[69.9]
1476,36
[58.1]
1300,5 [51.2]
130
[5.1]
S20,S21,S90
02
189
[7.4]
296,5
[11.7]
DCU
ROOF IP21-42
ISU
Inverter
display
Control
Panel
01
09
400 [15.75]
1000 [39.37]
600 [23.62]
1030 [40.55]
850 [33.46]
128
[5.0]
1500 [59.1]
1750 [68.9]
2002,5 [78.84]
2129,5 [83.84]
LIFTING LUGS

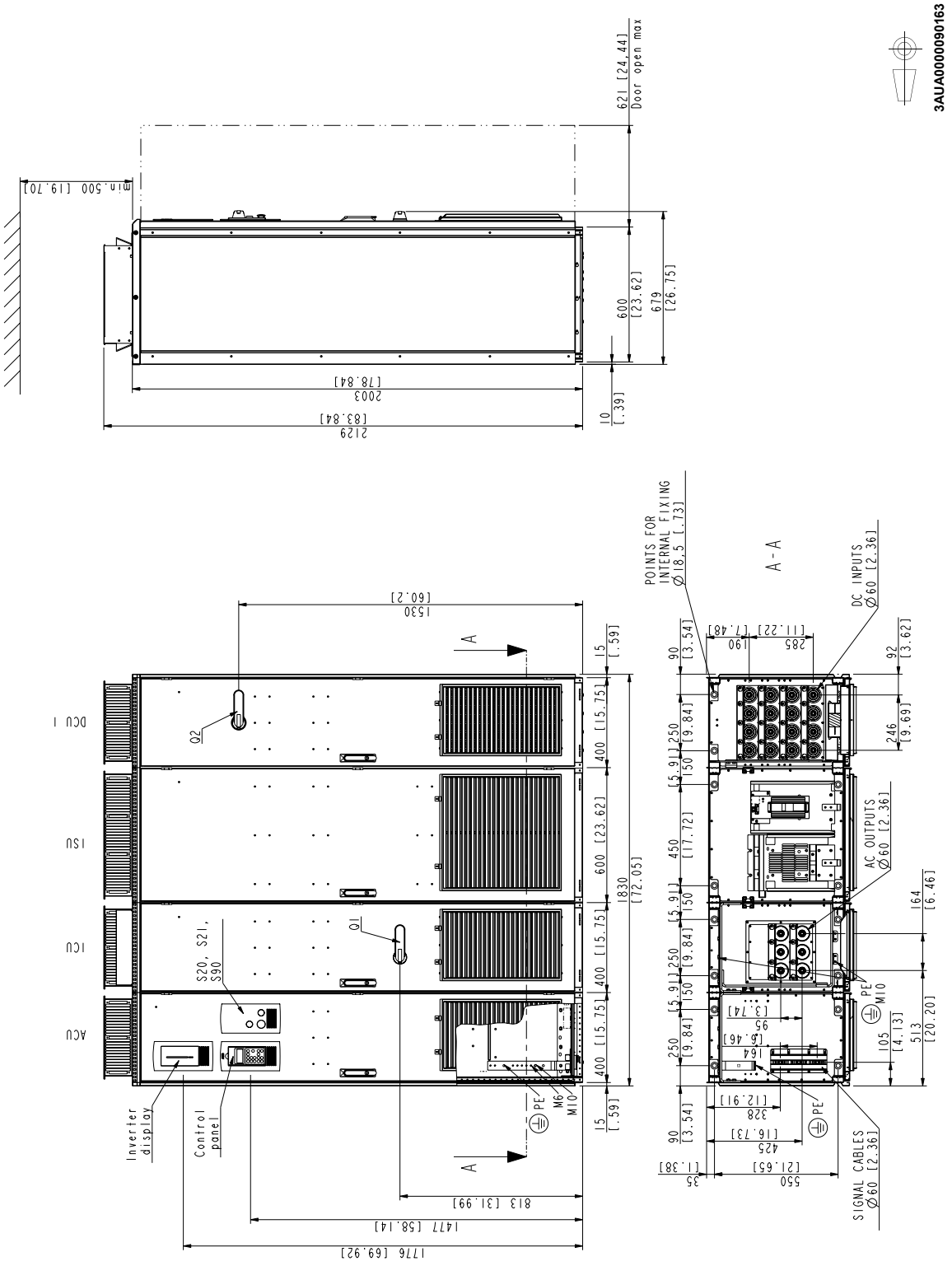
AC output:


3AUA0000083128
L1
L2
L3
PE
115,5
[4.5]
44
[1.7]
44
[1.7]
162,5 [6.40]
112,5 [4.43]
Ø13
[.51]
86,5 [3]
86,5 [3.4]
40 [1.57]
531 [20.91]

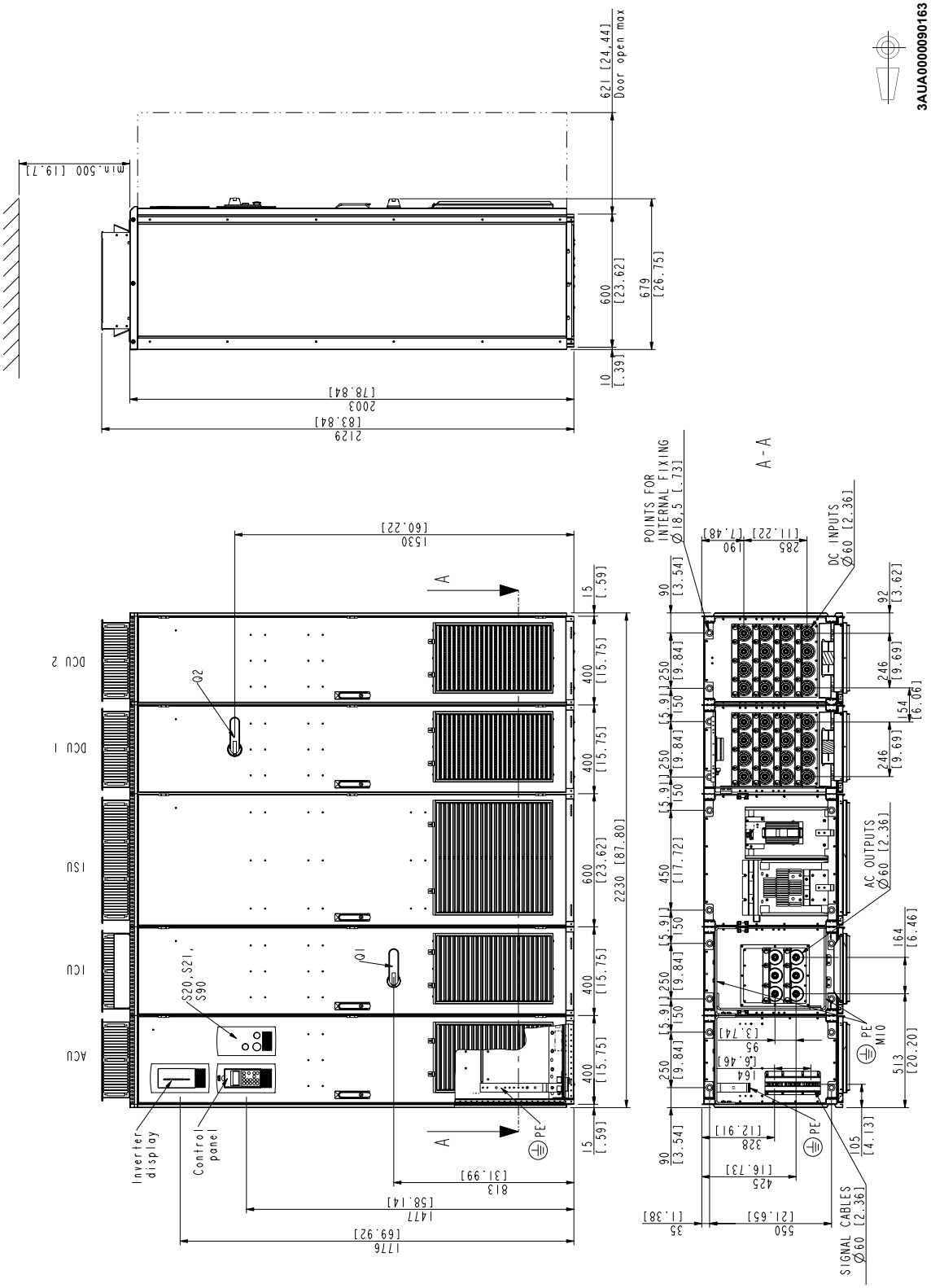

Four DC inputs
DCP
DCM
PE
3AUA0000083128
329,5 [13.0]
88 [3.5]
364,9 [14.37]
STRINGS 1/3
513 [20.20]
STRINGS 2/4
One DC input
145,5 [5.73]
130 [5.1]
Ø13 [.51]
50 [1.97]
260 [10.2]
40 [1.57]
492,5 [19.39]

Frame R8i

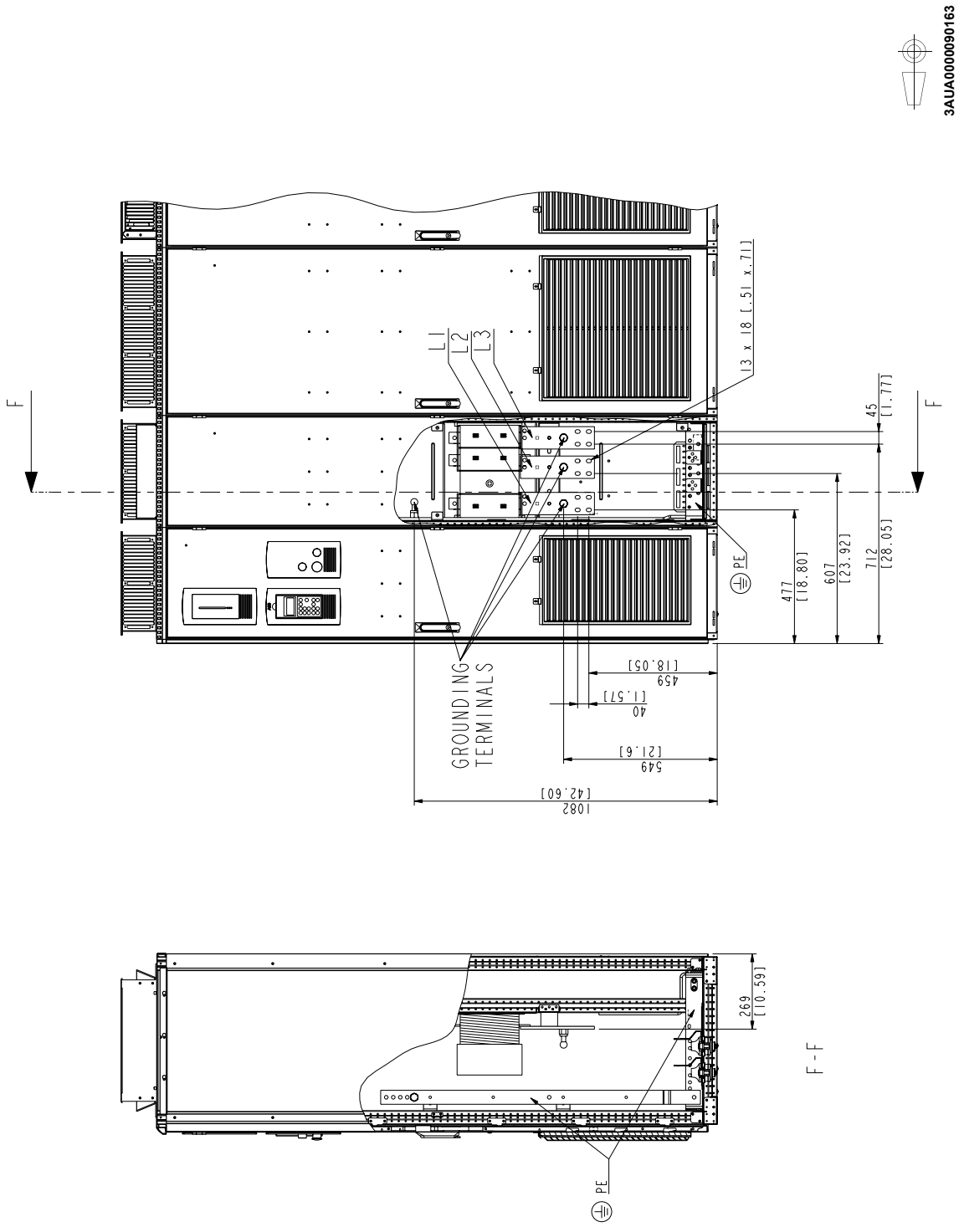
R8i – Two DC inputs as standard, four DC inputs with option +4H382:



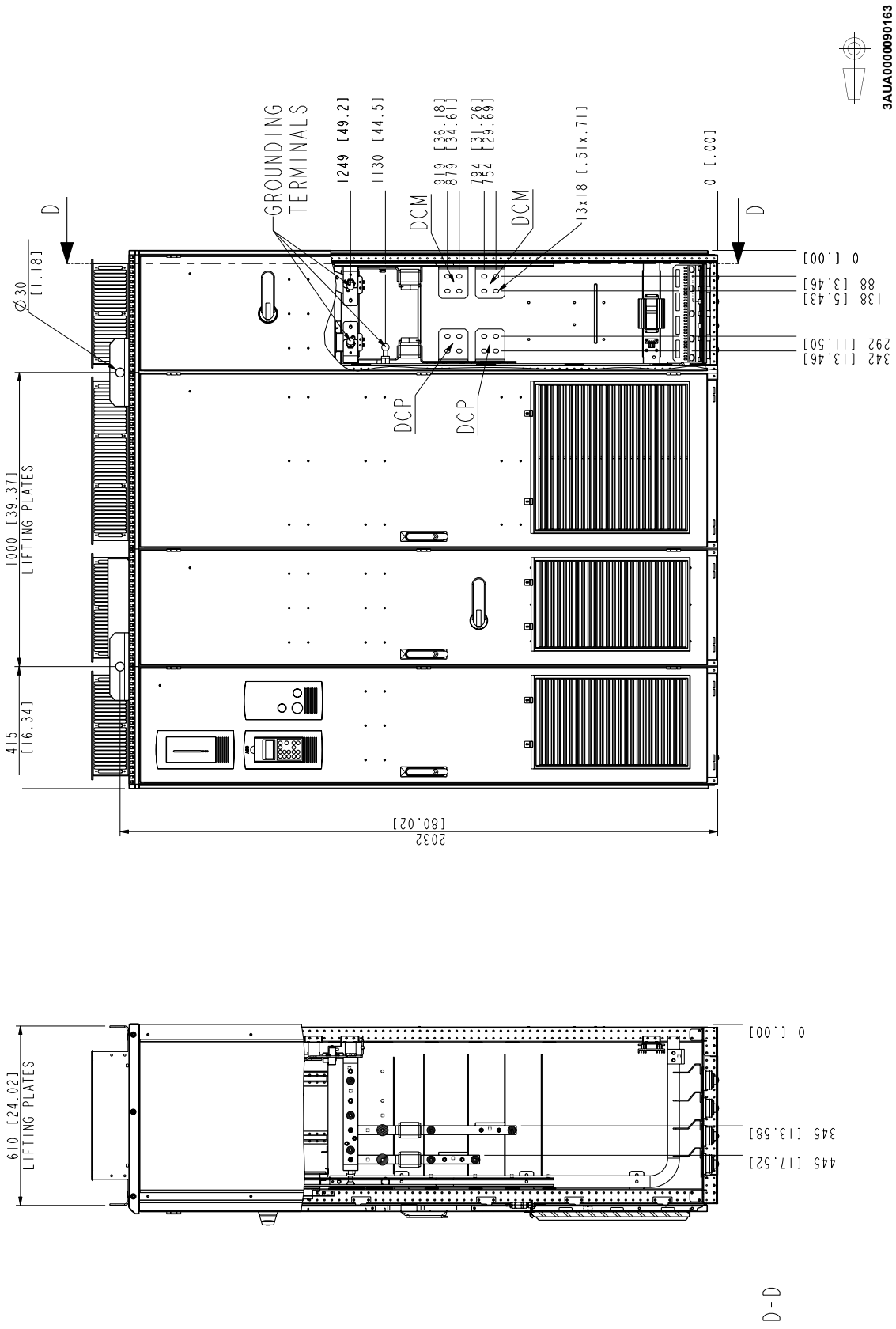
R8i – Eight DC inputs (option +8H382):



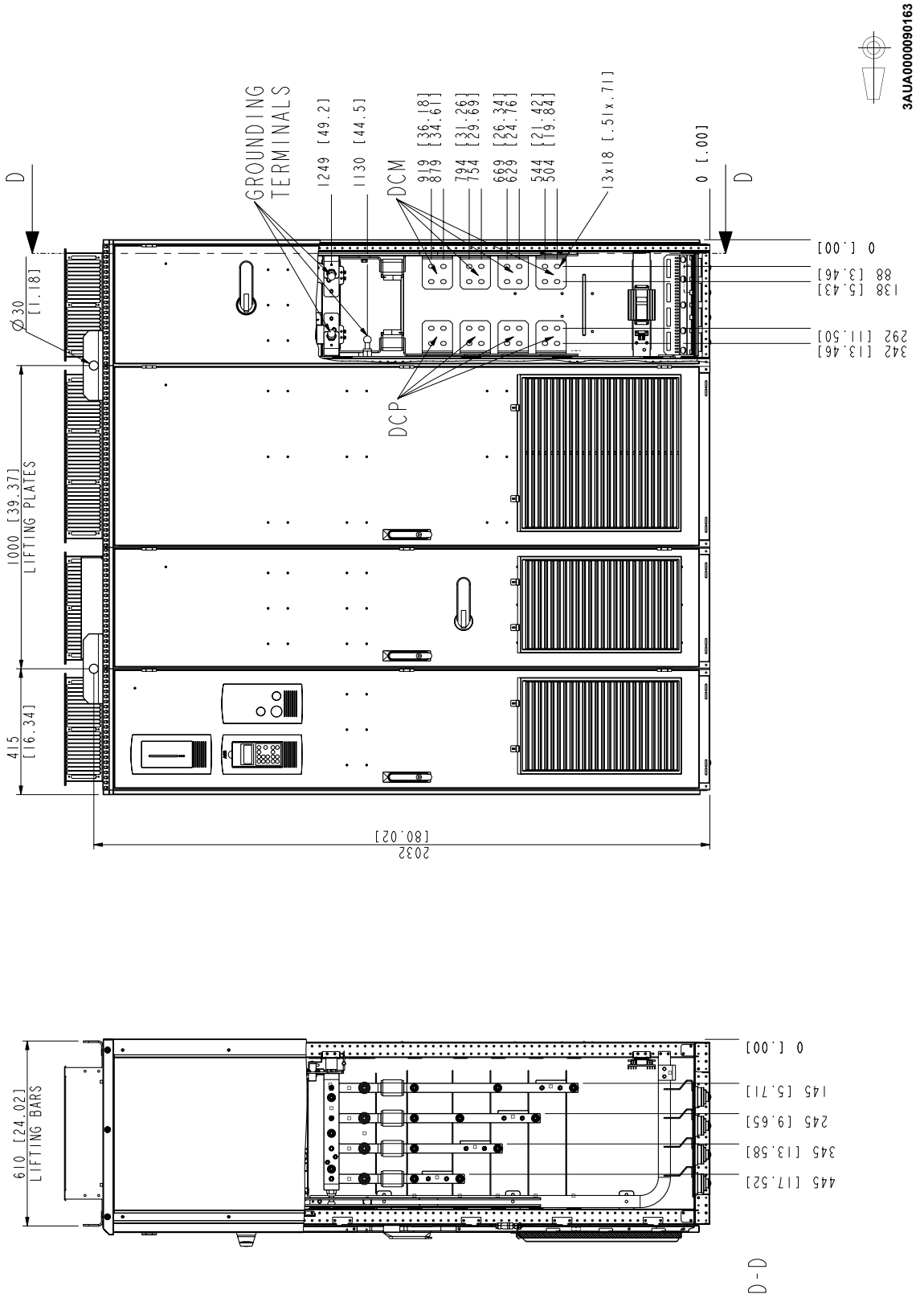
R8i – AC output terminals:



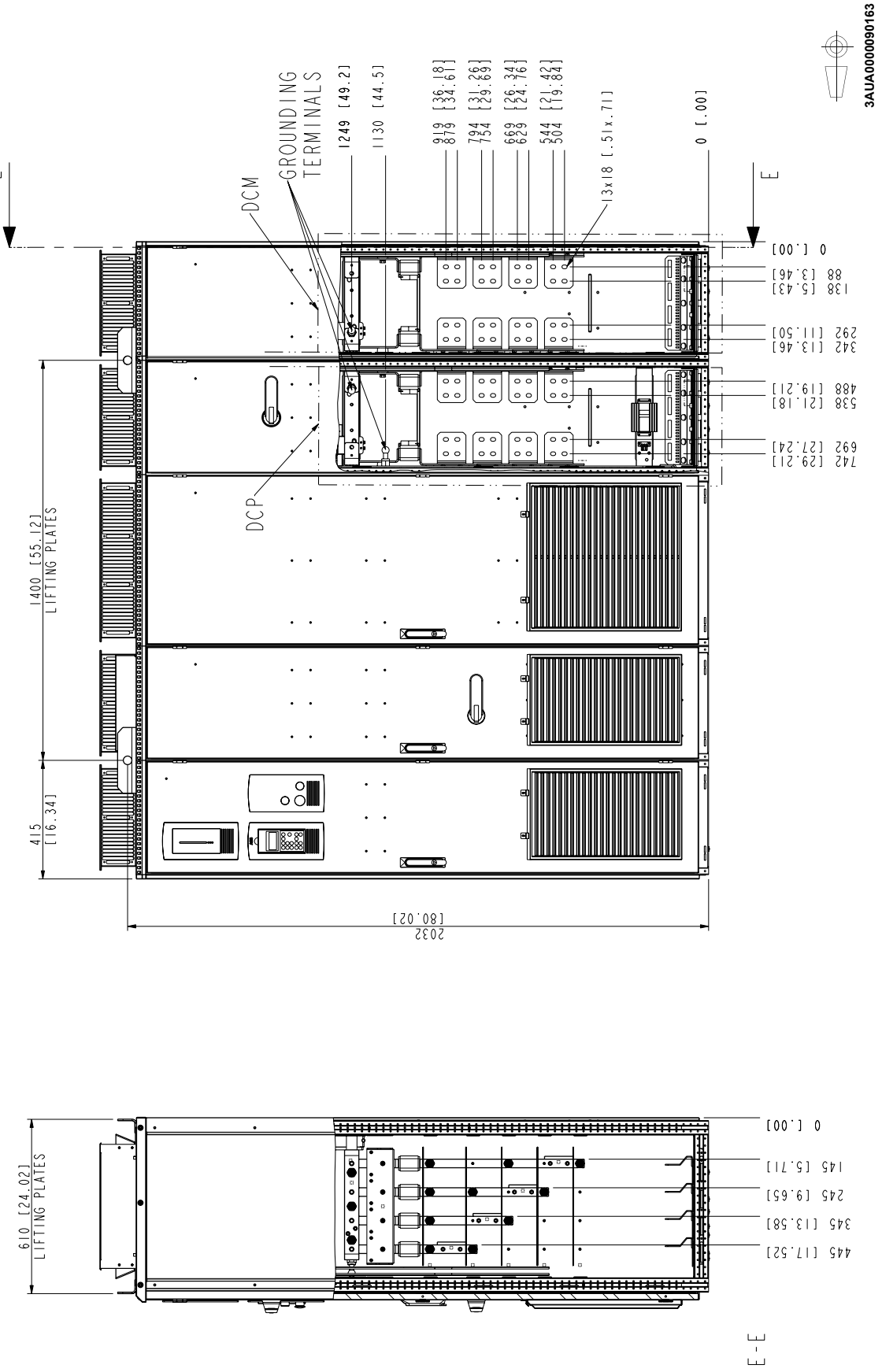
R8i – DC terminals of units with two DC inputs (standard):



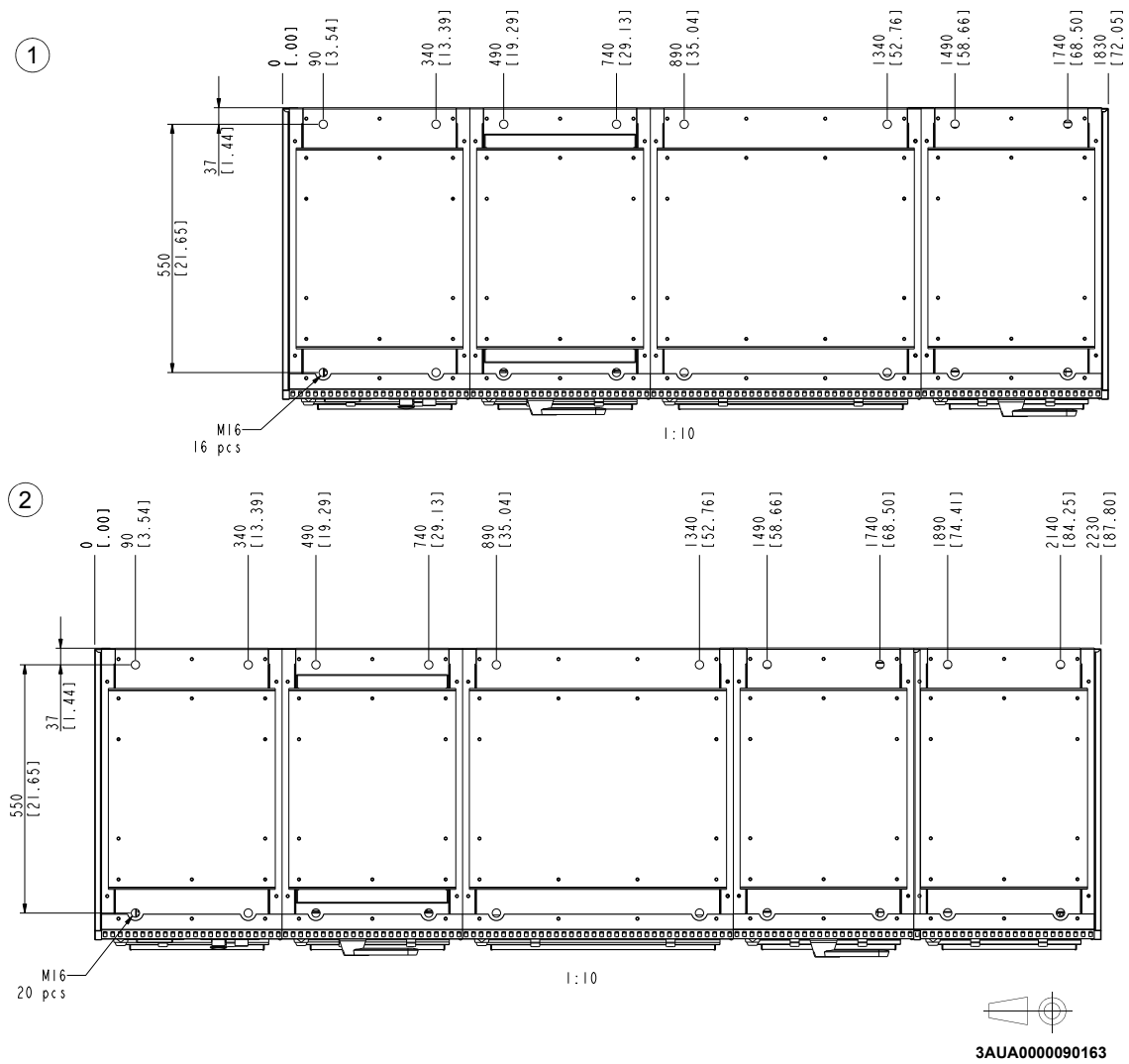
R8i – DC terminals of units with four DC inputs (option +4H382):



R8i – DC terminals of units with eight DC inputs (option +8H382):



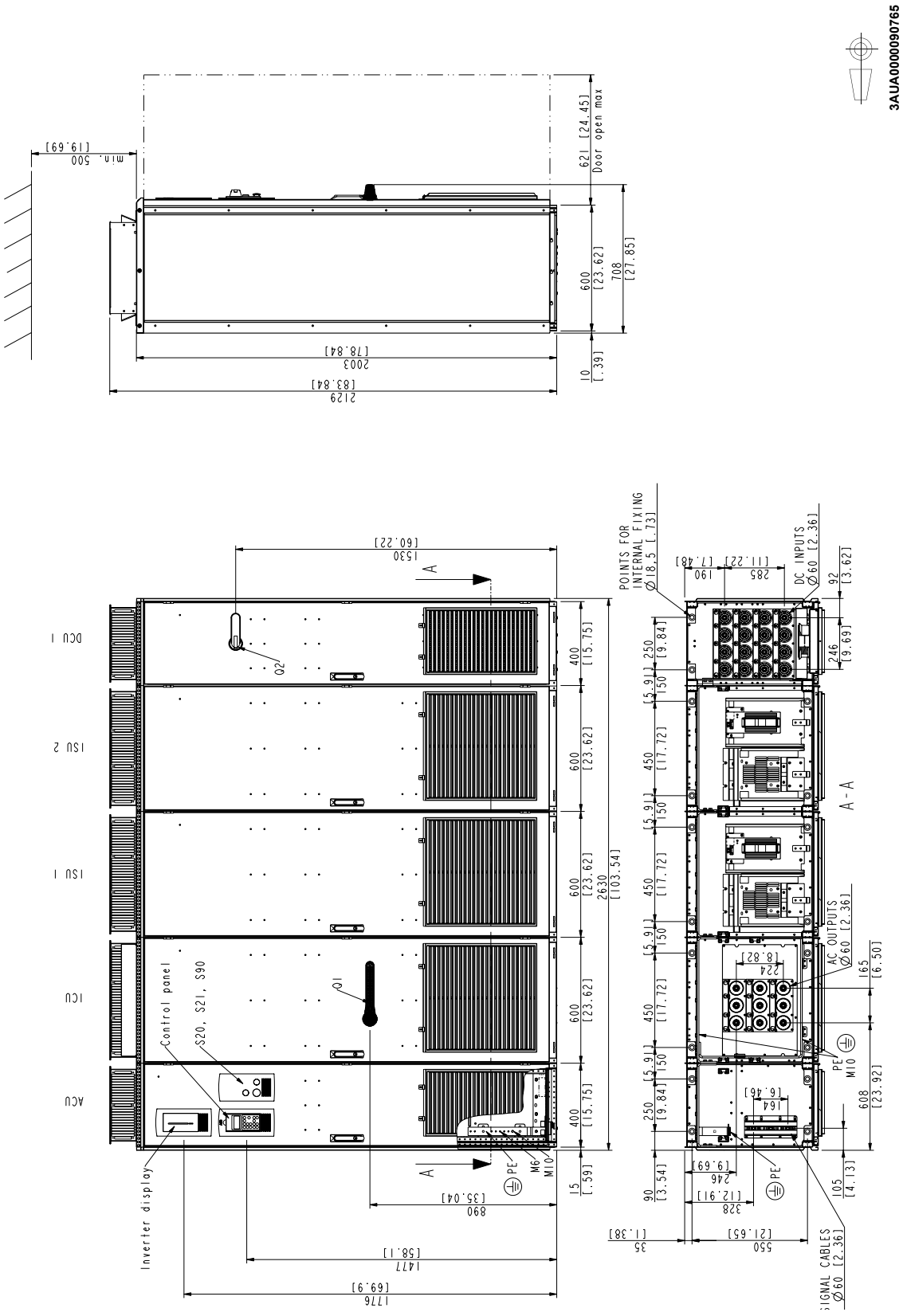
R8i – Top view of fastening points:



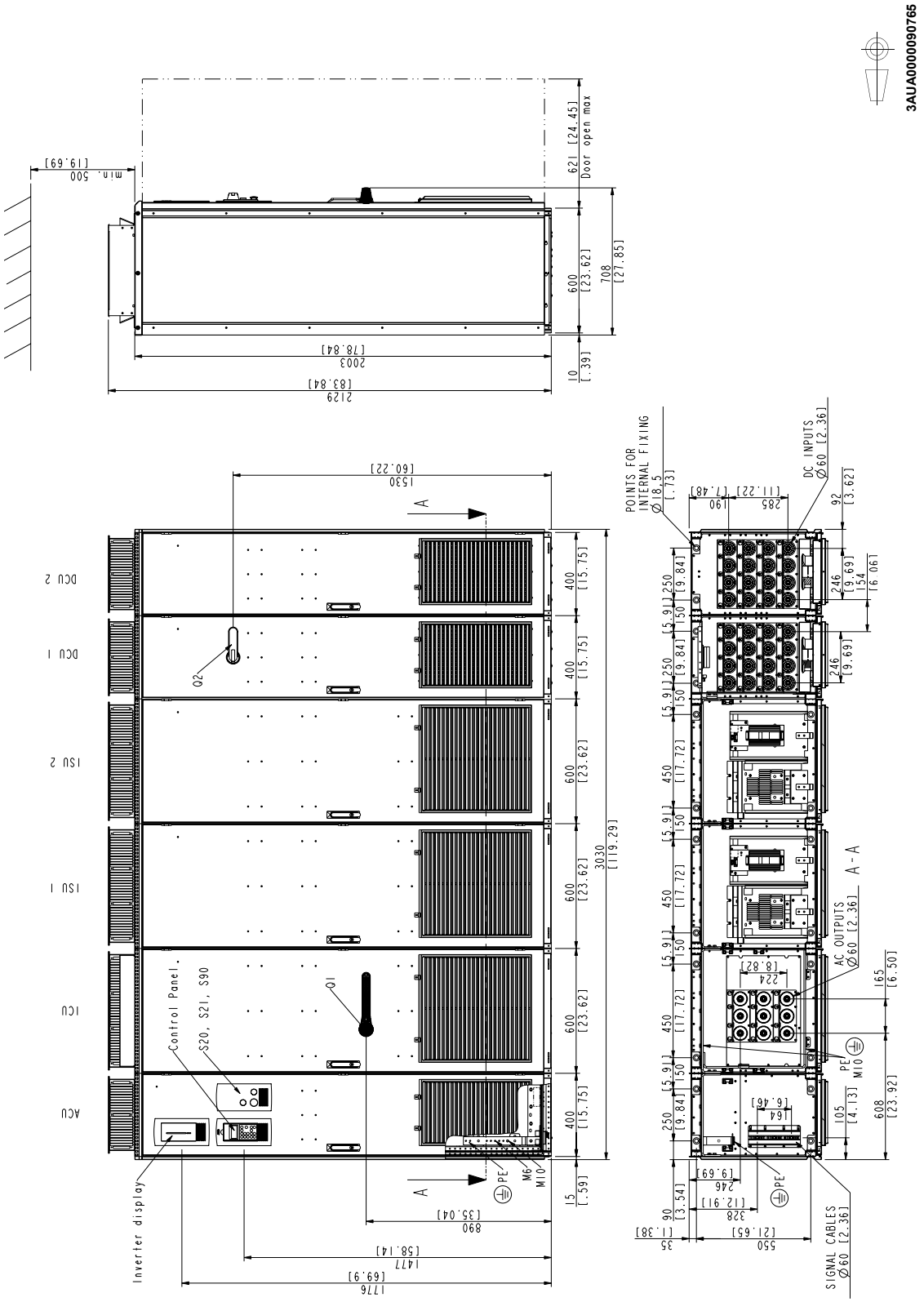
1) Two DC inputs (standard), four DC inputs (option +4H382), eight DC inputs with miniature circuit breakers (option +H377)
2) Eight DC inputs (option +8H382)

Frame 2 × R8i

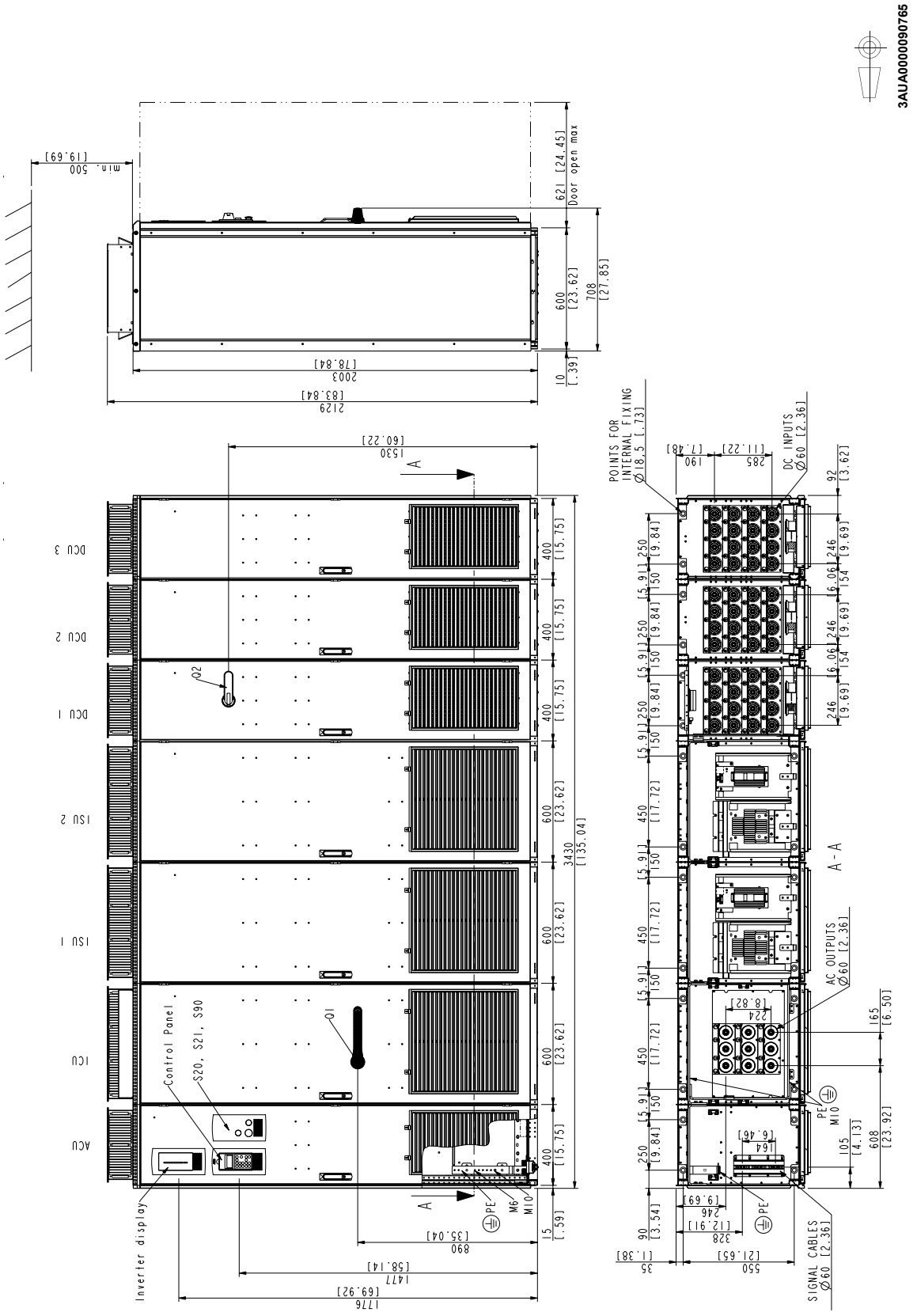
2 × R8i – Four DC inputs (standard):



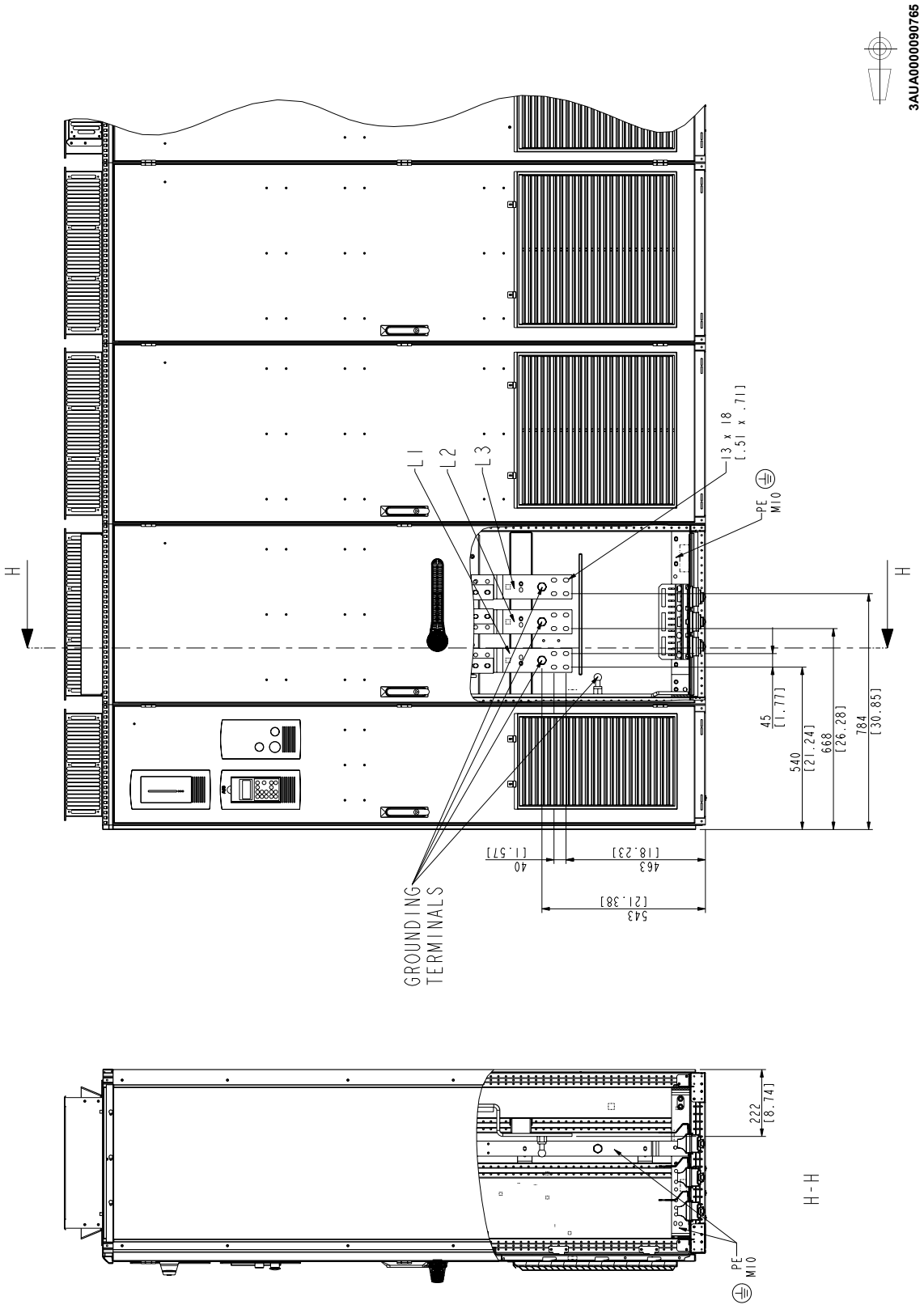
2 × R8i – Eight DC inputs (option +8H382):



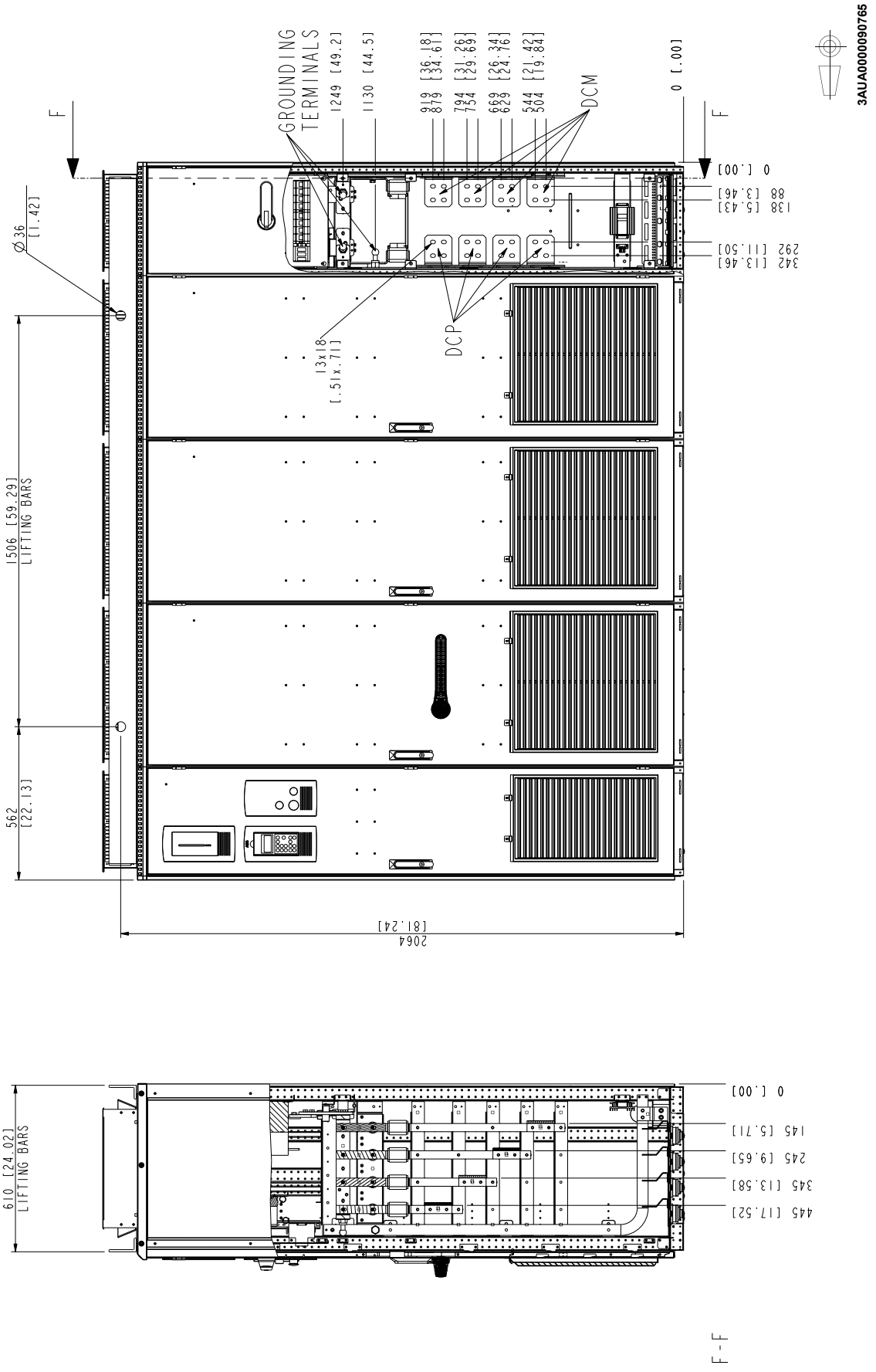
2 × R8i – Twelve DC inputs (option +12H382):



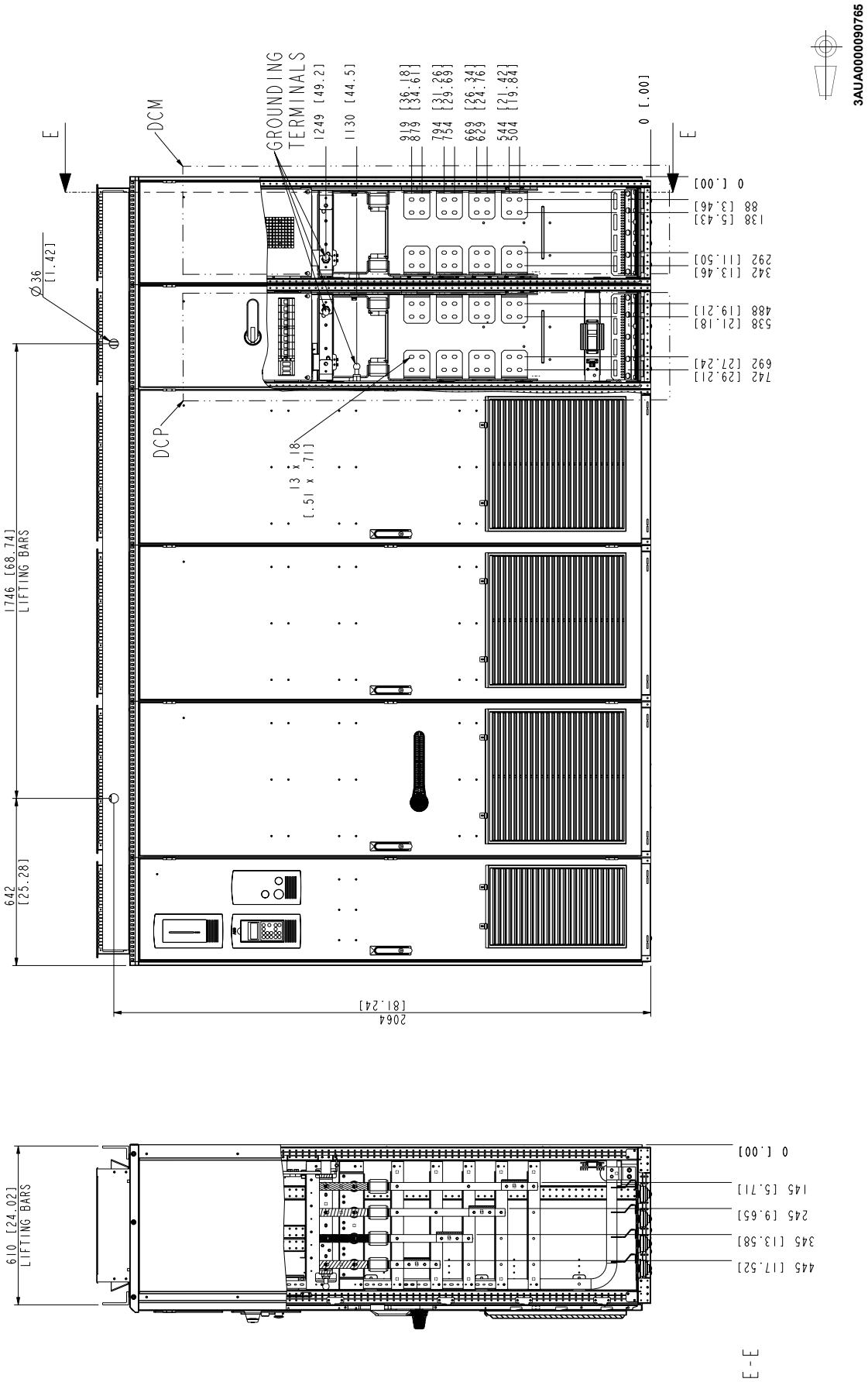
2 × R8i – AC output terminals:



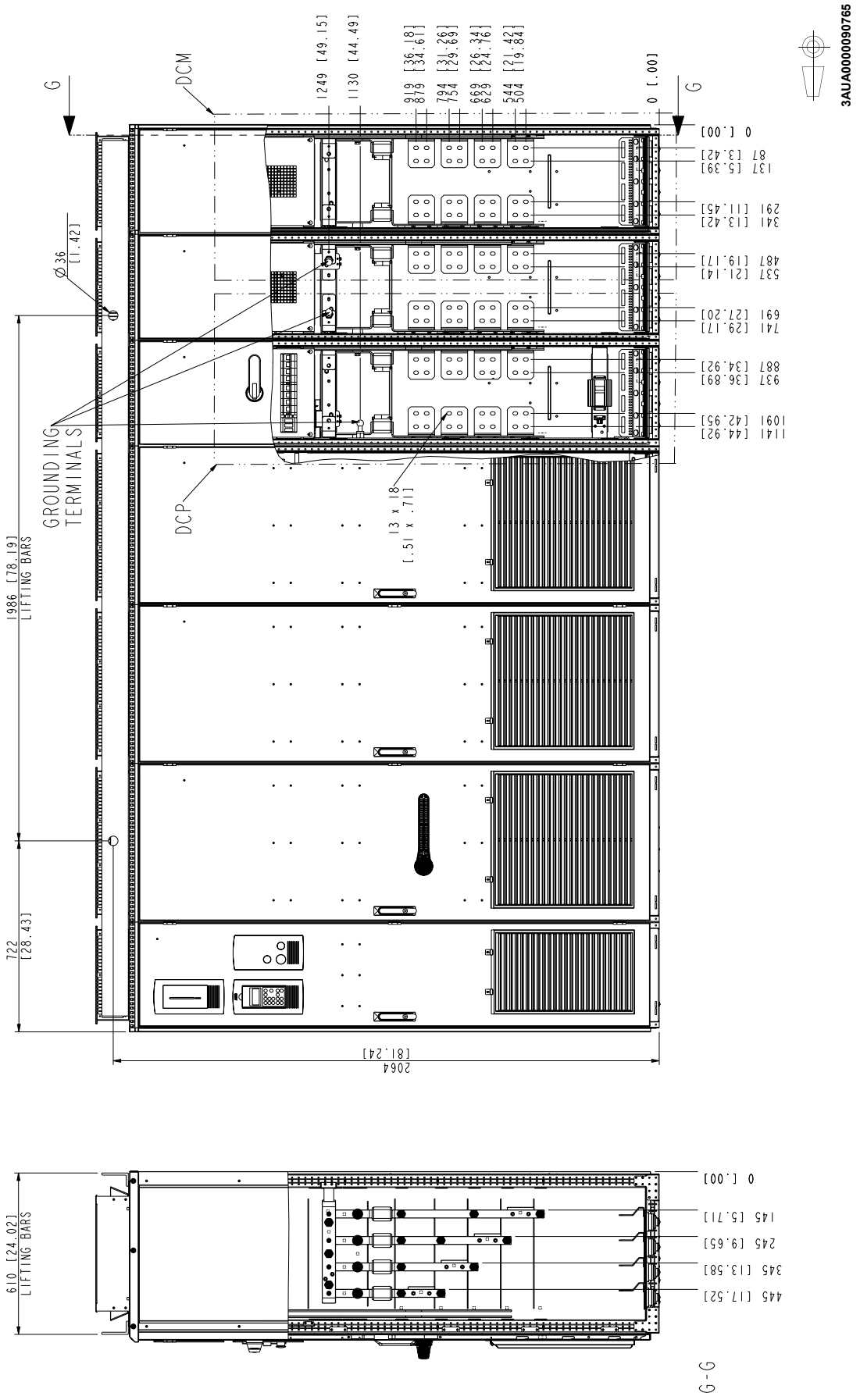
2 × R8i – DC terminals of units with four DC input terminals (standard):



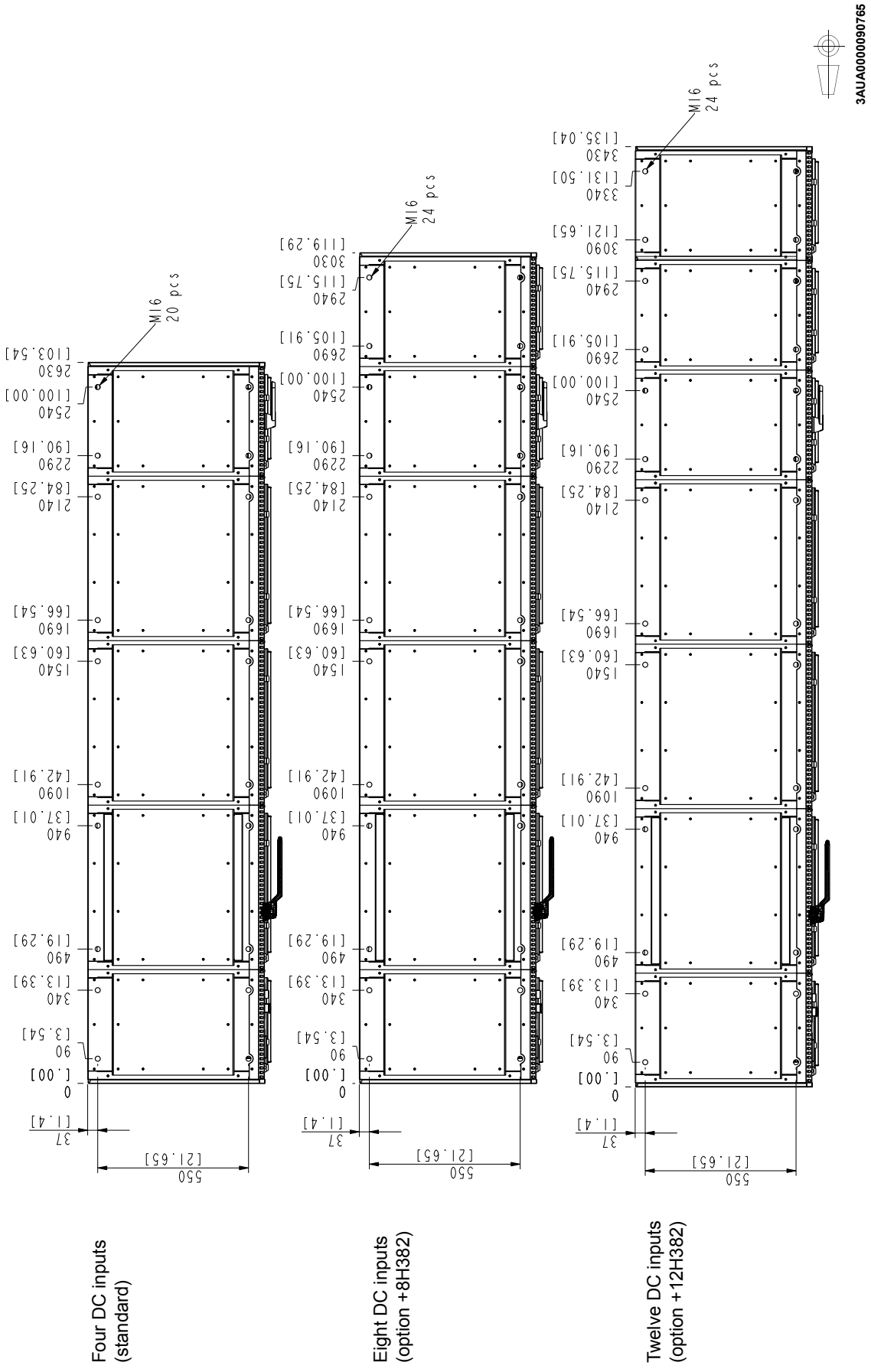
2 × R8i – DC terminals of units with eight DC input terminals (+8H382):



2 × R8i – DC terminals of units with twelve DC input terminals (+12H382):



2 × R8i – Top view of fastening points:



Further information

More information about ABB products for solar applications on the Internet: www.abb.com/solar.

Contact us

www.abb.com/solar

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